THE LANGUAGE OF BOTANY

by

C. N. DEBENHAM

Museum of Applied Arts & Sciences, N.S.W.

A Publication of The Society for Growing Australian Plants

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FOREWORD

The following has its origin in a requirement for a glossary to cover the three years progress of your journal. From the list prepared of terms used, it was apparent that contributors to "Australian Plants" form a very diverse group with interests covering a wide range of botanical lore and application. This varied group, representative of the reader's interests, is the image the writer has endeavoured to keep in mind in his selection of terms amplifying those of the glossary.

In compiling this minor dictionary, the writer was guided by what appeared to him as current concept epitomized in standard reference, individual paper, and abstract; the list of literature consulted is a lengthy one and space requirements preclude its inclusion. The survey showed a serious lack of authoritative botanical dictionaries which were not confined to taxonomic and morphological fields. Akin with other dictionaries, the value for such works lies in their ability to provide a convenient reference to terms of the specific language without aspiring to replace the textbook.

There is much to criticise in this work. Some terms have been given an abundance of space, others too little; there is inadequate attention paid to citation of examples. Due to limitations in time, some serious errors are bound to appear. Even the most ambitous works seldom escape this ignominy. Such errors, however, have a value in that time devoted in establishing lack of veracity is time devoted to clarifying the issue in the mind of both disputer and disputed.

The writer alone is responsible for error, but errors can be corrected. The means—communication. A function of the Museum is an information service covering not only technology and the arts, but also the fields of chemistry and botany in their pure and applied senses. This service is yours, as taxpayer—why not use it?

C. DEBENHAM
Museum of Applied Arts & Sciences
Harris Street, Ultimo, Sydney.

ACKNOWLEDGMENT for illustrations. The writer expresses his gratitude for the help given in the preparation of the figures which, although few in number, are original in design. In avoiding obvious error, the criticism of Messrs. J. L. Willis and B. E. Small, Director and Research Officer respectively of this museum, were helpful and most appreciated. In the final preparation for reproduction, special thanks are due to Miss E. Ham and her assistant Miss C. Murray, not only for their skill but also for their cheerful attitude and willing co-operation at such short notice.

ABBREVIATIONS: APPL.—in one sense applied to; AUCTT.—of authors; Cf.—contrasting with; ET AL—among others; ICON. (icone)—illustration of; IN SYNON.—in synonymy (recently shown to be a synonym of); NOM. (nomen)—name, as in nom. nudum (a name used as a taxon but without diagnosis hence not acceptable); PRO PARTE—in part; Q.V.—which follows (refer under this name); SENSU LATIORE—in the wider sense; SENSU STRICT—in the strict sense; SP.—a species of; SPP.—species of.

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A—: prefix, **not** or **without: atypical**—not typical; **asexual**—without sex.

ABAXIAL: remote or turned away from the axis. **cf.** adaxial.

ABERRANT: differing from the normal; atypical.

ABORTIVE: imperfectly developed or undeveloped.

ABRUPTLY: adverb indicating sudden change in shape as **abruptly acuminate**—with a rounded apex suddenly changed in outline by a central terminal process.

ABSCISSION: falling away or separation of an organ (as leaf, fruit) or part from parent body, frequently by a rupturing of the thin walls of cells grouped in an **abscission layer** when associated with a deficiency in auxin production.

ABSORPTION: uptake or imbibition by a substance of a substance which may or may not be changed in the process. Cf. adsorption **Appl. (e.g.)** uptake of water and mineral solute from the soil by a root system. A particular form is diffusion. See also under leaf (foliar absorption).

ACAULESCENT: with stem not apparent above ground (as the subterranean caudex of Burrawang, **Macrozamia spiralis**).

ACCESSORY BUD: a bud normally dormant but capable of developing to an accessory shoot when the growth-inhibiting influence is removed.

ACCESSORY FRUIT: a fruit possessing conspicuous part not derived from gynoecium (a fleshy or hardened receptacle, closely-enveloping bracts, etc.) Also **composite fruit.**

ACCLIMATION: process by which, through cross-breeding and selection, a species or population attains tolerance to a changed environment. Also **acclimatization.**

ACCRESCENT: increasing with age. **Appl.** fruit or floral parts increasing in size after or during flowering period (calyx, **Ceratopetalum gummiferum**).

ACEROSE: needle-shaped (leaf, **Grevillea acerosa** etc.; petals **Verticordia acerosa**).

ACHENE: dry, indehiscent, 1-seeded fruit with thin tight outer wall (**Clematis** etc.)

ACHLAMYDEOUS: without a perianth, (She-Oak **Casuarina** spp., Sea Tassel **Rupia spiralis.**, **Zostera**, the **Pandanaceae** et al.)

ACICULAR: needle-shaped, as leaves of **Daviesia acicularis.**

ACIDITY: degree to which a substance in solution dissociates hydrogen ion content. Substances releasing an excess of hydrogen (H^+) to hydroxide (OH^-) ions are acids and their acidity is expressed by a pH value representing the negative logarithmic scale of the hydrogen ion concentration in grams per litre. As acidity increases, the pH value decreases numerically from 7.0 (neutral) to 1.0.

ACQUIRED CHARACTER: modification in the character of an organism as a direct response to a changed environment, not shown to be capable of transmission through the genes to later generations (**e.g.** prostrate habit developed by individuals of normally erect populations when exposed perpetually to wind-blown conditions).

ACROPETAL: ascending, as leaves and flowers developing in succession on an axis so that youngest is at apex (**e.g.** racemose) or the normal development of root-hairs. **Cf.** basipetal.

ACTINOMORPHIC: regular and symmetrical; radially symmetrical.

ACULEATE: furnished with prickles (Bristle Poppy, **Papaver aculeatum**).

ACUMINATE: with apex acute and tapered to a point.

ACUTE: with the apex forming acute or sharp angle.

ADAPTATION: character developed within a population of value in surviving conditions of environment inhabited.

ADAXIAL: turned toward axis, **Cf.** abaxial.

ADELPHOUS: see under—delphous.

ADHERENT: in close proximity but not fused with another part of unlike kind. **Cf.** coherent.

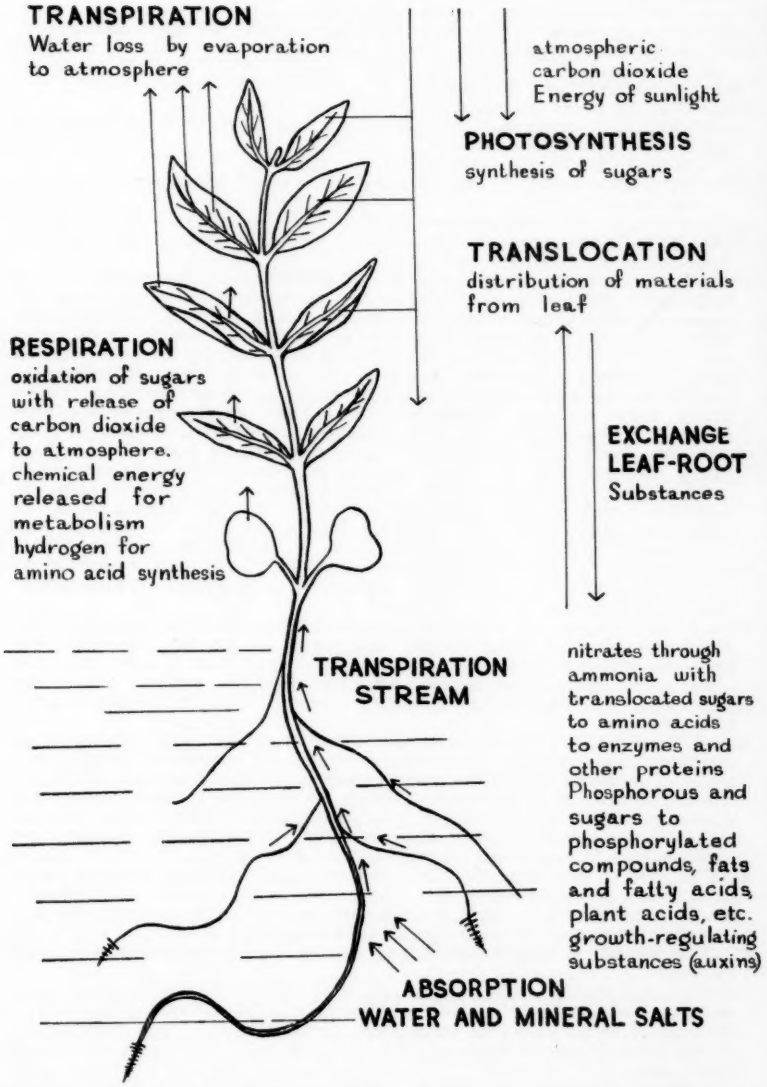
ADNATE: organically united (fused) with another part of unlike kind from beginning of inception (as ovary of eucalypt fused with receptacle). **Adnation**—the adnate condition.

ADSORPTION: attraction and adherence of electrostatically-charged particles to one another (as attraction of colloids of humus-rich soils to mineral ions).

ADVENTITIOUS: arising from unusual position or in other than regular order, as growth of root from leaf or stem, or leaf-bud developed at internode as in Norfolk Island Hibiscus **Lagunaria patersonii.**

ADVENTIVE: temporary extension in dispersal of plant introduced to locality, as temporary spread of weed-growth.

AERATION: **Appl.** exchange of air with high carbon dioxide content for air with optimum oxygen content (e.g. a high carbon dioxide and low oxygen content in soils with inadequate aeration are limiting factors in growth of most plants).



FACTORS OF GROWTH AND DEVELOPMENT

AERENCHYMA: specialised tissue with large intercellular air-spaces, frequent in aquatic plants and providing bouyancy for them, and in roots of many bog plants.

AERIAL ROOT: root normally exposed to atmosphere, as that of epiphyte or prop-root of Pandanus, adventitous from stem.

AEROBIC: in presence of gaseous or molecular oxygen. See also respiration.

AESTIVATION: (1) arrangement of floral parts within bud (2) summer dormancy due to drought.

AFTER-RIPENING: see **stratification.**

AGAMOSPERMY: see **apomixis.**

AGGLOMERATE: aggregated in clusters, as fruit of Blue-leaved Stringybark **Eucalyptus agglomerata.**

AGGREGATE FRUIT: see under **fruit.**

ALBUMIN: water-soluble protein of many cereal seeds, and enzyme constituent of various plant cells.

ALBUMINOUS: containing **endosperm.** (q.v.) when applied to seeds in general.

ALEURONE GRAIN: grain of protein in endosperm, frequently (as in grasses) dispersed in an outer aleurone layer.

ALGAE: unicellular, or multicellular and filamentous or thalloid plant, mostly associated with waters of ponds or seas, possessing chlorophyll frequently masked by other pigments hence autotrophic, reproducing asexually by fragmentation (fission) or by spores and sexually by identical spores (isogamy) or unlike spores (anisogamy). May be classed under following divisions: **Euglenophyta (Euglena); Cyanophyta**—blue-green algae **(Oscillatoria); Chlorophyta**—green algae **(Spirogyra, Ulva, Codium); Chrysophyta**—yellow-green algae, golden-brown algae, diatoms **(Tribonema, Dinobryon); Phaeophyta**—brown algae **(Sargassum, Hormosira, Ecklonia); Rhodophyta**—red algae **(Nemalion, Polysiphonia); Pyrrophyta—cryptomonads** and **dinoflagellates (Cryptomonas, Ceratium).** Estimated that up to 80% of total photosynthetic activity contributed by algae hence suggest alternative solution to world food problem. Local use as fertilizer centuries old (mainly as kelp), dried material yielding up to 15% readily available potash (potassium chloride mainly), abt. 2% nitrogen and much organic material which slowly decays in soil to form valuable humus.

ALKALINE SOIL: soil reducing growth of most plants (see **halophyte)** by possession of alkalinity of pH 8 or higher and/or percentage of exchangeable sodium or potassium of 15% or higher.

ALKALINITY: degree to which a substance in solution dissociates hydroxide ions. Substances releasing excess of OH^- (hydroxide) ions to H^+ (hydrogen) ions are bases or alkalis. When OH^- and H^+ ions are dissociated in equal concentrations, the substances are neutral. Alkalinity expressed by pH value which numerically increases, as the alkalinity increases, from 7.0 (neutral) to 14. **Cf.** acidity.

ALKALOID (PLANT): organic substance, characterised by cyclic nitrogen base, distributed apparently as non-functional product of metabolism within protoplasm of members with some concentration in families Solanaceae, Papaveraceae, Apocyanaceae, et al but distribution otherwise at random. Outstanding Australian native plants yielding commercially-important alkaloids are **Alstonia constricta** (reserpine), **Dubiosa myoporoides** and **D. leichhardtii** (hyoscine and hyoscyamine), **D. hopwoodii** (nicotine and nor-nicotine).

ALLELE: one of two dissimilar genes which occupy identical positions (loci) on homologous chromosomes and which carry factors acting as alternative conditions in inheritance. **Multiple alleles** are members of a series of more than two alleles possessed by a genotype. Also **allelomorph.**

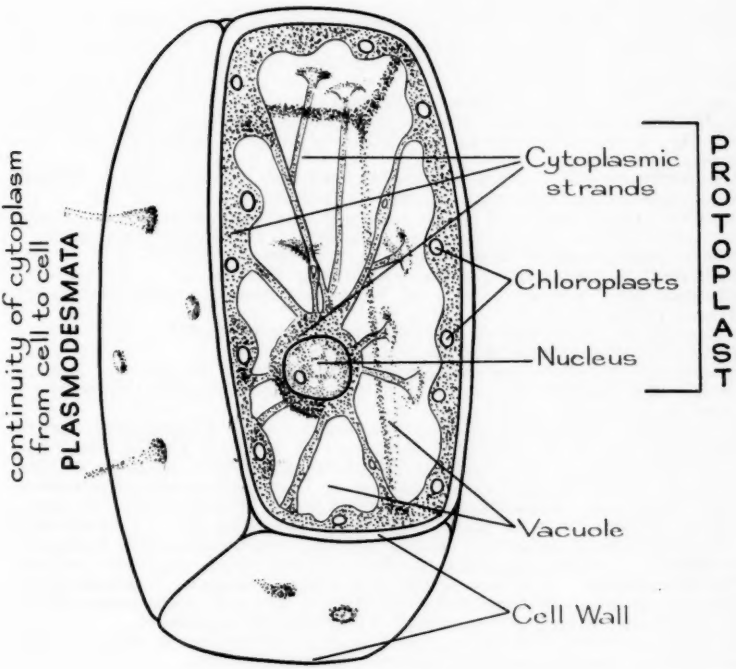
ALLOPOLYPLOID: polyploid derived from hybridization between widely different species.

ALPINE: of elevated habitats where snow covers ground continuously from six to twelve months of the year. i.e. above the tree-line. In Victoria and N.S.W. the level of winter snow-line varies from 4,500-5,000ft. (Vic.) and 5,000-5,500 ft. (N.S.W.) and sub-alpine conditions exist where ground is normally snow-covered continuously for 1-4 months of year—this is the range of the snow gum **(Eucalyptus niphophila)** but due to geographic influences snow-gum is known to occur at 6,500ft. at Jagungal north of Kosciusko and at slightly more than 6,000 ft. on the Kosciusko plateau.

ALTERNATE: placed at differing levels or in spiral arrangement. **Appl.** disposition of leaves on a stem.

ALTERNATION OF GENERATIONS: alternation of haploid (gametophytic) and diploid (sporophytic) generations; for most organisms either entirely haploid

THE PRIME FUNCTION OF AN ORGANISM IS CONVERSION AND UTILIZATION OF ENERGY



EACH ORGANISM STRUCTURALLY IS OF A CELL OR SYSTEM OF CELLS REPRESENTED IS A CELL CAPABLE OF TRANSFORMING SOLAR ENERGY TO CHEMICAL ENERGY ie. PHOTOSYNTHESISING

except for the zygote, or entirely diploid except for the gametes. The gametophyic and sporophytic generation may be similar (some algae), the gametophyte may be the most pronounced (some algae and fungi, the bryophytes) or the sporophyte may be the most conspicuous (some algae and fungi, vascular plants).

AMINO ACID: organic substance with both acidic and basic properties, possessing the groups $-NH_2$ (amino) and -COOH (carboxiyl) and able to combine with other amino acids to form long chains by linkage of its acid and basic groups. A structural unit of a protein from which it may be reformed by hydrolysis with an acid. For all proteins found within plant tissues relatively few amino acids are required in their synthesis.

AMPHIPLOID: polyploid resulting from hybridization between two or more diploid species separated by barriers of hybrid sterility.

AMMONIUM: ionic form by which (a) nitrogen is absorbed by root from soil or, if nitrogen absorbed as nitrate, form which nitrate is reconstituted within plant and (b) nitrogen is utilised in synthesis of an amino acid.

AMPLEXICAUL: stem-clasping, as the base of a leaf almost surrounding its node (Prickly Hakea, **H. amplexicaulis**, juvenile leaves of many eucalypts):

ANAEROBIC RESPIRATION: break-down of sugars and other organic materials for the release of energy, in the absence of oxygen. Usually identified with **fermentation** (q.v.)

ANALOGOUS: similar in function to another organ (usually from a different organism) but not similar in structure or development.

ANASTOMOSING: forming a net- or mesh-work, as minor veins of many dicots.

ANATOMY: science of macroscopic and microscopic structure of organisms.

ANDRO-. prefix, **male**, as in **andropetalous**—with petaloid stamens.

ANDROECIUM: male part of flower constituting stamens.

ANDROPHORE: elongated part of receptacle bearing entire androecium **(Brachychiton**, etc.)

ANEMOCHORY: dissemination of seed through agency of wind.

ANEMOPHILY: pollination through agency of wind.

ANEUPLOID: phenotype possessing chromosome number not an exact multiple of its basic (haploid) number. **Aneuploidy**—loss or increase of a chromosome from basic number.

ANGIOSPERM: member of dominant seed-bearing class **Angiospermae** with no single feature clearly separating assemblage of **c.** 300,000 species from other seed-bearing plants (gymnosperms) but characterised by:— enclosure of seed, presence of vessels in wood, production of flower as complex reproductive unit Of families, **Compositae** undoubtedly make up greatest number of species (range 25.000-30,000 in at least 1,000 genera) closely followed by **Orchidaceae** (range 15,000-20,000 in abt. 800 genera) then, in order, **Papilionaceae, Rubiaceae, Gramineae, Euphorbiaceae.** Other families with over 3,000 species are **Labiatae, Scrophulariaceae, Cyperaceae, Melastomaceae, Myrtaceae, Asclepiadaceae, Liliaceae. Acanthaceae, Umbelliferae.** Most widespread and largest from numbers of individuals making up the species populations is **Gramineae.**

ANION: the negatively-charged ion (see ionisation). Of concern to plant nutrition are nitrate, phosphate, sulphate, carbonate and chloride ions.

ANISOPHYLLY: difference in form between upper and lower leaves of a horizontal shoot, or between upper and lower surfaces of such leaves, frequently as a result of external forces (viz. gravity and light).

ANNUAL: of one year's growth duration from seed to seed production.

ANTERIOR: of side facing away from object to which part is related. **e.g** facing outwards or farthest away from an axis. **Cf.** posterior.

ANTHER: pollen-bearing part of stamen, typically divided by tissue strip (connective) to two lobes (anther-lobes or sacs) dehiscent through longitudinal slit-like openings, each lobe-chamber is a **theca** or **locule**, each theca making up two sporangia **(q.v.)**

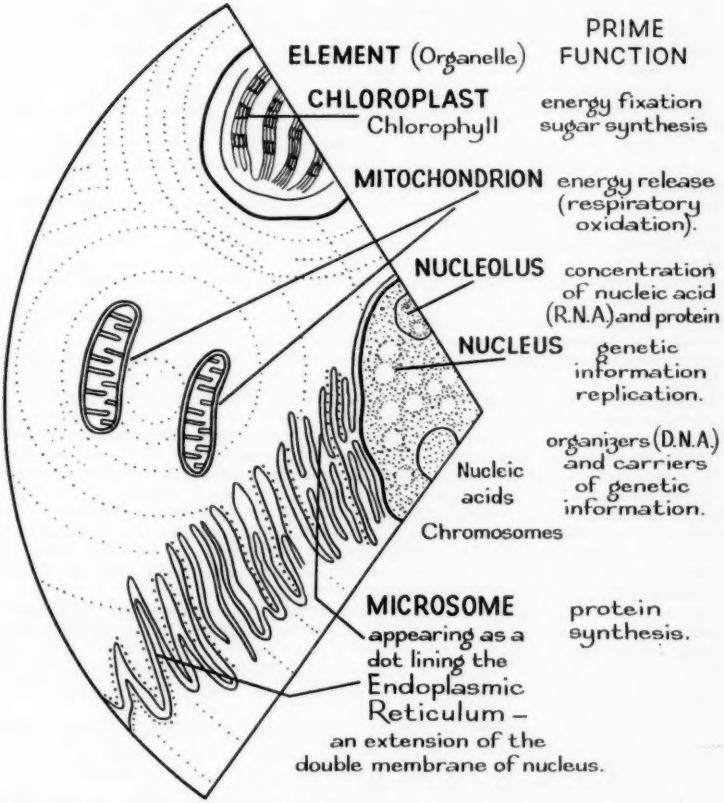
ANTHERIDIUM: organ of spore-bearing plant producing male gametes—analogous to stamen of seed-bearing plant.

ANTHESIS: process of flowering. or the flowering period.

ANTHO-: prefix. **flower**, as in **anthophilous**—attracted by flowers.

ANTHOCYANIN: water-soluble pigment frequently dispersed in plant cytoplasm, typically a glycoside which may be hydrolysed by enzyme or acid to non-sugar component, an anthocyanidin. Anthocyanidins (pelargonidins, cyanidins, delphinidins) change colour (reds. blues, yellows) according to acidity of dispersal media so giving variety in colour conspicuous **(e g.)** in floral parts. See also **carotenoid.**

THE LIVING CELL IS AN ENERGY-HARNESSING AND TRANSFORMING UNIT WITH INTRICATE SUBMICROSCOPIC ORGANIZATION THE MOLECULAR STRUCTURE OF ITS ELEMENTS UNIQUELY IS LARGE AND COMPLEX.



ENLARGEMENT OF ACTUAL CELL about 30,000 diameters.

ULTRA-MICROSCOPIC STUDY OF SECTOR OF PROTOPLAST FROM PREVIOUS FIGURE

APETALOUS: without a corolla (most **Ceratopetalum** spp.).
APICAL DOMINANCE: suppression of lateral bud development and dominance of the terminal bud, manifested in the erect relatively unbranched habit of **(e.g.)** forest trees as compared with the shrubby habit when both terminal (leading shoot or "leader") and lateral shoot development proceed more or less equally.
APICULATE: terminated by an abrupt short point (anther, **Eriostemon** spp.)
APOCARPOUS: with the carpels free from one another in the gynoecium, or with a single carpel.
APOGAMETY: development of an embryo from a **diploid gametophyte** (q.v.) by division of a cell other than egg-cell, with or without pollination and (partial) fertilisation, the zygote so formed being maternal in genetic constitution.
APOMIXIS: reproduction which replaces or serves as a substitute for sexual reproduction.Two principal types in formation of **apomict: (1) vegetative reproduction** whenever there is a suppression of normal sexual reproducion so that normally accessory structures (as buds, stolons, etc.) substitute completely, or when the reproductive elements are detachable fully-formed plantlets (propagules) developed from meristem or primordia (of, e.g., leaves) or are bulbils (formed, e.g., in sterile inflorescences). (2) **agamospermy** involving production of an embryo and seed (see **parthenogenesis, apogamety)** with fertilization and meiosis suppressed, the resultant embryo usually with a genetic constitution identical with its maternal parent. See also under **polyembryony.**
APOSPORY: formation of a diploid gametophyte (q.v.) by the direct (ameiotic) division of a cell of nucellus or integument of an unfertilized ovule or, more commonly, from the soral or sporangial tissue of ferns.
APPOSITION: addition of new layers to already existing layers in the formation of a cell wall, Cf. intussusception.
APPRESSED: closely and flatly pressed against, as stem-appressed leaves.
ARBORESCENT: tree-like in habit (as the tree-like banana, a perennial herb).
ARCHEGONIUM: the organ of a spore-bearing plant producing the female gamete —analogous with the ovule of a seed-bearing plant.
ARCHESPORIUM: single cell, or group of cells, which differentiates within a developing anther or ovule to spore mother cell/s.
ARIL: large fleshy outgrowth from coat of seed, (arillate seed of **Podocarpus** spp.).
ARISTATE: with a stiff bristle (arista), (aristate glumes of the Spear Grasses, **Aristida** spp.).
ARMILLARIA: fungus, **Armillaria mellea** (Fam. **Agaricaceae**, Class **Basidiomycetes)** the Honey or Shoe-String Fungus, responsible for severe attack of roots of woody plants by strangulation through encirclement with cord-like mycelia, besides causing rot of their tissues.
ARTICULATED: jointed, with nodes or joints where separation possible.
ASSIMILATION: absorption of nutrient and its synthesis to the complex constituents of an organism, i.e. anabolism.
ASSOCIATION: community with members stable and making up a uniform structural pattern. Related associations form **alliances.**
AUTO-: prefix, **self,** as in **autogamy**—self-fertilization, **autotrophic**—synthesising organic food material from inorganic material through energy derived from external source, a character of the green plant.
AUTOCATALYSIS: acceleration of a catalytic process by products of reaction themselves acting as catalysts (as break-down of cell-structure by products formed within cell).
AUTOPOLYPLOID: polyploid derived from a single ancestral species, usually by intraspecific hybridization.
AUXIN: see growth substance.
AWN: bristle-like appendage. Also **arista.**
AXIL: angle formed by a part in relation to its parent body, as the angle angle formed by a leaf or bud in relation to the stem.
AXILLARY: within the axil. Axillary buds and flowers are those borne in leaf-axils.
AXIS: the main stem or central line of development of an organ or organism.
BACCATE: berry-like of a fruit with fleshy or pulpy texture as that of Lilly Pilly **Acmena smithii.**
BACKCROSS: cross-fertilization of hybrid with one of its parents, the resultant progeny being the **backcross generation.**
BACTERIUM: see under **fungus.**
BARK: collective term for tissues of woody plant outside cambium. Outermost

layers which are readily stripped from trunk or older branches represent alternate layers of periderm and dead phloem tissues and make up a rhytidome. The rhytidome provides insulating barrier to atmospheric water and gas exchange; the inner layers (inner bark) of periderm and phloem are actively functioning, the periderm forming a protective sheaf (sometimes acting for storage) for the layers of phloem.

BASIPETAL: converse of acropetal (q.v.).

BAST: old term now replaced by phloem (see also under fibre).

BERRY: pulpy or fleshy, indehiscent, few or many seeded fruit (Wild Orange, **Capparis mitchelli).**

BIENNIAL: of two year's growth duration ,flowering during the second year.

BILATERALLY SYMMETRICAL: capable of division into two equal parts only (flower of **Telopea** spp.).

BIO-: prefix, **life,** as in **biochemistry**—chemistry of living processes.

BIOCENOSE: community of organisms of a particular habitat.

BIOTA: the flora and fauna of an area.

BIOTYPE: population of individuals having same genetic constitution (the **same genotype).** Usually only one individual of cross-fertilized plants will retain genotype but progeny from self-fertilizing population with pure genetic constitution will belong to same biotype.

BISEXUAL: with male and female reproductive parts both present and functional. **Appl.** a (single) flower.

BLENDED INHERITANCE: intermingling and non-segregation of alleles from parents of a hybrid at a fertilization.

BIVALENT: a pair of associated homologous chromosomes.

BOG PLANT: member of plant community dominated by hummock-forming mosses and acid-tolerant shrubs, developed under swamp or marsh conditions.

BRACT: leaf, usually modified in shape and size, at base of primary axis of inflorescence (i.e. peduncle): **bracteate**—with bract/s, **ebracteate**—without bract/s.

BRACTEOLE: accessory bract at base of secondary axis(pedicel) of inflorescence **bracteolate**—with bracteole/s.

BRYOPHYTE: member of chlorophyll-bearing moss division **Bryophyta,** an assemblage of terrestrial, arboreal or rarely aquatic (as **Ricciocarpus)** plants attached by root-like rhizoids to moist sites which vary from rock-face to ditch-side, either prostrate and thalloid, or erect and bearing tufts of leaves. Conspicuous plant gametophyte producing motile male spore in antheridia and an egg-cell within each archegonium. Fertilization requires moist conditions, the resultant sporogonium consisting of a stalk-borne capsule is the sporophyte, nutritionally dependent on gametophyte. Under dry conditions, asexual spores released from sporogonium and germinate on moist sites to new gametophytes. Reproduction of gametophyte also from separation of branches or from special structures gonidia and gemma (more feature of **Hepaticae). Classification:** Class **Hepaticae-liverworts, the thallus habit predominant (Marchantia,** etc.); **Anthocerotae**—simple thallus with sex organs embedded **(Anthoceros,** etc.); **Musci**—mosses, the germinating spore developing to a flat thallus or branched filamentous protonema with the gametophyte arising from this **(Sphagnum, Funaria, Dawsonia,** etc.).

BUD: growth point of stem together with protective enclosure of specialised leaves or scales, capable of initiating elongation of stem and branches or development of leaves and reproductive elements. See also **primordium.**

BUD-SPORT: branch, flower or fruit with genetic constitution different from that of parent body.

BUDDING: method of vegetative propagation by which a bud (or short piece of stem with bud attached) removed from parent is brought in contact with callus of stem of actively-growing rooted plant so that union of cambia is possible.

BUFFER: substance, usually a salt, capable of controlling or resisting changes in acidity or alkalinity of a medium by its release of sufficient counteracting hydroxyl or hydrogen ions. Colloids and solutes present in most soils and to lesser extent roots have property of buffering pH of a soil.

BULB: underground bud enclosed by fleshy scales formed from bases of leaves.

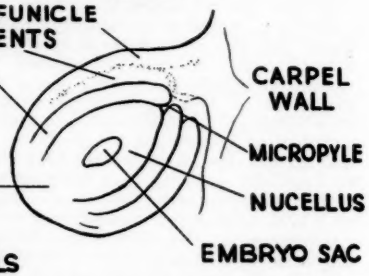
BULBEL: small bulb arising as off-shoot from parent bulb.

BULBIL: small bulb arising from leaf-axil, inflorescence or other adventitous origin from parent plant.

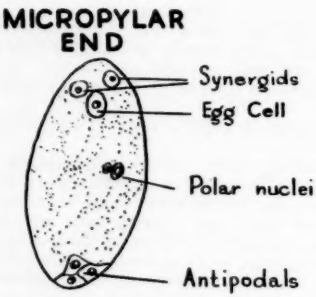
BUTTRESS-ROOT: flattened extension built from root and stem to form in

EACH CELL IS DERIVED FROM A PRE-EXISTING CELL

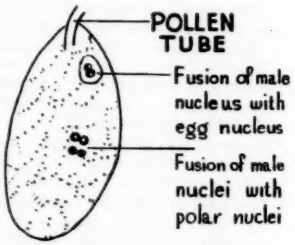
SECTION OF FLOWER



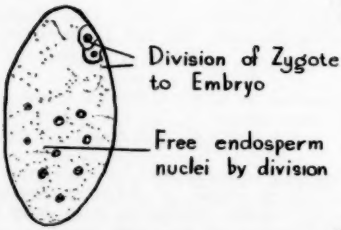
INTERNAL STRUCTURE OF OVULE



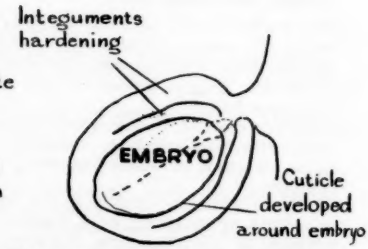
MATURE EMBRYO SAC



FERTILIZATION



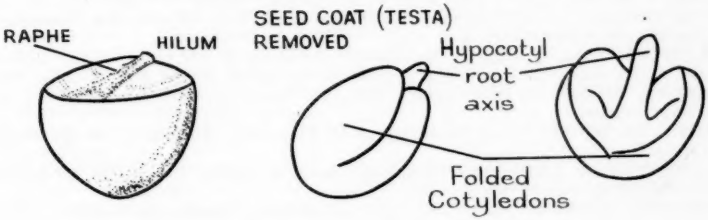
DEVELOPMENT OF INDIVIDUAL



Endosperm absorbed by cotyledons, nucellus broken down by developing embryo

A EUCALYPT SEED ARISING FROM SINGLE CELL

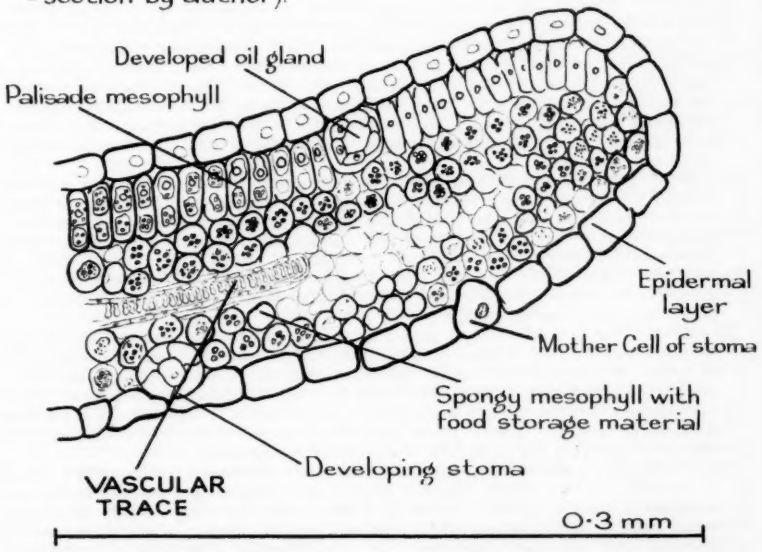
CELLS BECOME SPECIALISED FOR SECONDARY FUNCTIONS SO FORMING TISSUE SYSTEMS



SEED AT DEHISCENCE

TRANSVERSE SECTION OF COTYLEDON PART

(from embryo of Eucalyptus dives, before germination - section by author).



DIFFERENTIATION WITHIN EMBRYO

mature trees prominent buttresses—feature of some tropical rainforest trees **(Ficus, Tarrietia, Sloanea spp.** et al.)

CADUCOUS: falling or withering away very soon after development (petals of **Ceratopetalum gummiferum).**

CAEPITOSE: matted or tufted, as hummock-forming grasses.

CALLUS: mass of tissue, developed usually from a cambium as a protective covering to a wounded surface capable, under suitable conditions, of active division to form new structures (See also **wound hormone)** or union of stock and scion at a grafting. In general, a hard prominence on a surface.

CALLUS (of ORCHIDS): (plural calli) prominence, varied in number, form and arrangement, on labellum of certain orchid flowers **(Cyrtostylis, Caladenia, Chiloglottis, Glossodia** et al.)

CALYPTRA: hood or cap, as the cap-like covering of calyptrate buds, flowers and fruits (calyptra formed by a cohesion of petals in the bud of Lilly Pilly, **Acmena smithii** and Rose Apple, **Syzygium moorei,** which falls away as the flower expands).

CALYX: the primary sterile appendage of a receptacle, made up of sepals. Plural **calyces.**

CALYX-TUBE: a tube formed from the bases of sepals, frequently misapplied to the floral tube or receptacle.

CAMBIUM: continuous sheaf-like layer of meristem, formed as a residual from active division of meristem at the stem-tip. **Vascular cambuim** concerned with initiation of cells making up secondary growth by which a stem increases in girth. Cells initiated from cambium are either **fusiform initials** which reproduce for the vertical system of tissues or **ray** initials which reproduce for the transverse or ray system (q.v.) **Cork cambium** (phellogen) forming periderm displaces epidermis as protective secondary tissue system.

CAPILLARY WATER: part of soil moisture retained as film on, and within the pores of, soil particles in a continuous inter-particle system, the source of most water absorbed by a root.

CAPITATE: formed like a head or aggregated into a dense or compact cluster.

CAPITULUM: inflorescence with usually sessile flowers compacted into a dense cluster (Turpentine, **Syncarpia glomulifera,** most **Compositae, Actinotus** etc.).

CAPSULE: a dry fruit formed from a multi-carpelled ovary, usually opening at maturity along definite lines of dehiscence. Maiden's Blush, **Sloanea australis** (loculicididally dehiscent); Teak, **Flindersia australis** (septicidally dehisc.); **Portulaca** and **Papaver** spp. (circumscissile); Toad Flaxes **Linaria** spp. (poricidally dehisc.) Fruit of **Backhousia** spp. represents an indehiscent or not clearly dehiscent capsule.

CARBOHYDRATE: member of group of chemically related organic compounds which have the component carbon, hydrogen and oxygen atoms forming molecule in ratio of 1:2:1. Included are simple sugars (as hexoses and pentoses), disaccharides (as sucrose and maltose) and polysaccharides (starchs, gums, celluloses). Carbohydrates provide a source of energy for the activities of cell (see respiration) and form the group built-up by the green plant from atmospheric carbon dioxide and water, with radiant energy as activator. See photosynthesis, starch, sugar.

CARNIVOROUS PLANT: plant with necessary proteolytic enzyme system for direct breakdown of insect (or like small other animal) tissue for absorption of amino acid so released as an accessory nutrient. Often inconspicuous herbs, frequently elaborating special structures for capturing and holding prey, as the conspicuous sac-like pitcher developed from petiole of Pitcher Plant **Cephalotus follicularis** and the gland-tipped prominent hairs which cover the sundews **Drosera** spp. and the Rainbow Plant **Byblis gigantea.**

CAROTENOID: water-soluble terpenic substance dispersed within plant tissue as a yellow, red or orange pigment of a plastid, responsible for the appearance of these colours in leaves, flowers and fruit. The changing colours of autumn leaves due to initial withdrawal of chlorophyll to unmask a yellow carotenoid pigment and eventual break-down of this pigment. Carotenoids constituted exclusively of carbon and hydrogen are carotenes.

CARPEL: foliar ovule-bearing appendage of floral stem forming unit of gynoecium, unless rudimentary or simple made up of ovary, sterile style and pollen-receptive stigma.

CARPOPHORE: projection between carpels of a gynoecium formed as prolongation of receptacle sometimes as in **Triglochin striata,** united to form sterile carpels. Cf. gynophore.

CARUNCLE: small fleshy outgrowth at base or apex of carunculate seeds as those

of **Ricinocarpus** spp. and the Castor Oil Plant **Ricinus communis.**

CARYOPSIS: achene with seed coat adherent to pericarp, the characteristic fruit of the grasses.

CASPARIAN STRIP: band of lignified or suberised cellulose characteristic of angiosperm root endodermal cell-walls functioning conceivably in regulation of water movement by the restriction of its passage. See also diagram Translocation.

CATALYSIS: acceleration or retardation of a chemical reaction by a substance, the catalyst, which itself remains relatively unchanged during reaction. Catalysts of metabolic reactions are enzymes which, in general, are specific for one type of reaction, are required in very small amounts to produce relatively large changes in a substrate, and appear to function by at first chemically combining with the substrate to form a labile complex, the products of the reaction and the unchanged enzyme then being released.

CATAPHYLL: rudimentary leaf as a cotyledon, scale-leaf, or bud-scale, concerned with storage and/or protection.

CATION: positively-charged ion, the form in which mineral elements are absorbed by a plant.

CATION EXCHANGE: replacement of hydrogen ions absorbed on a surface (e.g. a clay) by cations. Cations with the property of hydrogen ion displacement are **exchangeable cations** and provide the condition in which mineral elements of the soil become available to plants.

CATKIN: spike formed from a pendulous rachis bearing unisexual flowers. Also **amentum.** Niggerhead Beech, **Nothofagus moorei).**

CAUDATE: bearing a tail-like appendage (anthers of the **Cynara** tribe of **Compositae**, e.g., **Centaurea, Carthamus, Cnicus**, etc.).

CAUDEX: trunk of a woody plant, either aerial (as of palms) or subterranean (as of some cycads) which persists from year to year slowly increasing in length and seasonally sending out a crown of leaves and floral stems.

CAULI-: prefix, **stem** as in **cauline**—borne on the stem. **cauliflorous**—with flowers borne on the stem.

CAULIFLORY: production of flowers on leafless woody stems or main trunks, the flowers developing from axillary buds borne on shoots and either continued from year to year until the shoot has become a thick branch or even main trunk, or remaining dormant until the shoot has reached a considerable diameter. A feature of trees and vines of tropical rainforests (members of **Leguminosae, Sapotaceae, Myrtaceae, Moraceae. Anacardaceae, Menispermaceae, Aristolochiaceae, Flacourtiaceae)** but not a strong characteristic of Australian rainforests.

CELL: organised, self-regulating, self-reproducing structural unit of living processes, differentiated (in plants) by an external wall to a protoplast with a system of organelles functioning interdependently. The protoplast is enclosed from the wall by a double-layered membrane and the concept of the method of entry of a substance in to the cell is that it is an invagination process, the membrane surrounding and engulfing either solution (pinocytosis) or finely-dispersed particle (phagocytosis) which may then be carried within vacuoles to the interior. See diagrams pages 5 and 7.

CELL SAP: see under **vacuole.**

CELLULOSE: major component of most plant cell walls, basically composed of long chains of glucose molecules, highly resistant substance biologically broken-down only by fungi and termites with necessary cellulose-splitting enzymes.

CELL WALL: metabolically inert, secretory product of protoplast forming the limiting layer of a plant cell and serving, either through turgidity of the contained protoplast or thickening of the wall itself, for mechanical support of tissue. Primary walls are largely pectic substances; those of adjacent cells may fuse to form a middle lamella, secondary development is intracellular and mainly cellulose, added by either apposition or intussusception but with small areas (pits) left unthickened, and, at maturity of wall, thickened according to function, e.g. lignification, suberization, cutinization. Continuity of protoplasm from cell to cell provided for by minute pores throughout the wall through which pass strands of cytoplasm (plasmodesmata).

CHALAZA: basal part of ovule marking site of attachment to funicle.

CHARTACEOUS: of papery or tissue-like texture, usually devoid of green.

CHASMOPHYTE: plant with habitat a rock crevice (e.g. a fern).

CHELATE: organic compound which forms in solution strong affinity for mineral ions (chelation) which prevents precipitation of the ion even under conditions

of high alkalinity, e.g. chelates E.D.T.A. (ethylene diamine tetra acetic acid) and H.E.E.D.D.T.A. (hydroxyethyl-ethylene diamine triacetic acid) have strong affinity for mineral iron in solution and may be used as foliar spray in correction of iron deficiency chlorosis.

CHIMERA: tissue mixture (e.g. evidenced by sector of a fruit different in colour or skin texture to rest) arising by either mutation of vegetative cells or by a mixture of meristems at a graft-union.

CHLORO-: prefix, **natural green** as in **chloranthy**—reversion of floral leaves to green leaves.

CHLOROPHYLL: green pigment of plants, essential as a light-absorbing agent in photo-synthesis, made up of a complex ring system within which is a single atom of magnesium. Chemically of two forms: the more abundant **chlorophyll a**, and **chlorophyll b** which has the methyl group of chlorophyll a replaced by an aldehyde group. Localised in granules of disc-shaped cell-inclusions, chloroplasts, in photosynthetic tissue.

CHLOROPLAST: plastid, unique to green tissue, made up of green-pigmented particles, **grana**, dispersed in a colourless **stroma** and enclosed by a membrane system. In addition to the chlorophylls and their associated yellow carotenoid pigment, grana contain proteins, lipids and inorganic elements, together with many enzyme systems, in all forming and operating as factory for photo-synthesis. Replication appears possible through division of precursor **proplastids** which in light, may develop to chloroplasts.

CHLOROSIS: condition induced by reduction in chlorophyll content in green tissue as evidenced by yellowing due to unmasking of carotenoid pigment. Chief agencies are deficiencies in sunlight and nutrient (viz. nitrogen, magnesium, sulphur and iron).

CHORI-: prefix, **separate** as in **choripetalous**—with petals of corolla not united.

CHROMATO-, CHROMO-: prefix, **coloured** as in **chromoplast**—plastid containing coloured pigment.

CHROMOSOME: inclusion of nucleus, thread-like in structure, visible at division of nucleus as spirally-formed ,thick, short rod and apparent at this stage to separate along length to form a pair. Each member of a pair is **homologous** with its complement and forms a bivalent, the number of pairs is constant (under normal conditions) in the vegetative cells for each member of a species (see **mutation, polyploidy**). At a division, each nucleus receives a complete set of members from each bivalent (but see **meiosis**): Along the length of each chromosome is marked in fixed position the **loci** of a series of **genes** (q.v.), each gene carrying a factor for a particular character, its arrangement on the chromosome providing a pattern influencing the development of the organism carrying it. See also **nucleus, nucleic acid.**

CILIATE: fringed wih hairs (calyx, **Verticordia** spp.)

CIRCUMSCISSILE: opening by transverse circular line, the valve usually coming away as a flap or lid. See **dehiscence, capsule.**

CIRCINATE: rolled from top downwards to form a coil, as the immature fronds of ferns.

CLADODE: flattened leaf-like stem functioning as leaf, arising from axil of much reduced, scale-like true leaf (Prickly Pears, **Opuntia** spp.). Also **cladophyll, phylloclade.**

CLASS: group of related orders, or single order, subordinate to division. Classes of division **Spermatophyta** (seed-bearing plants) are **Angiospermae** (flowering plants), **Conopsida** (conifers), **Ephedropsida** (the monogeneric **Ephedra** making up a single family, order and class). **Gnetopsida** the monogeneric **Gnetum** and **Welwitschia** making up single families united under single order of the class) and the **Cyadopsida** (cyads). When class is large in number of members (e.g. **Angiospermae**) a further division to sub-classes may be made, each sub-class ending in **-eae. Angiospermae** is divided thus into two sub-classes **Dicotyledoneae** and **Monocotyledoneae.**

CLAVATE: tapered to a thickened rounded top to appear club-like.

CLAW: flattened structure as the petiole-like base of a petal or the connated part of a staminal bundle (e.g. filaments of **Melaleuca** spp.)

CLAY: fraction of soil recognised as a plastic and glutinous material when moist, hard and cohesive when dry but with great influence on availability of nutrients derived by plants from soil. Finest-textured fraction (particle size ave. 0.002mm. dia.) exposing greatest surface area per mass, property influencing ability of particles to form colloids. Formed by chemical weathering of coarse materials of soil, mainly silicates (as kaolins), quartz and silica, oxides and hydrous oxides of iron, hydrous oxides of aluminium and calcium carbonate.

CLEISTOGAMY: production of inconspicuous self-fertilizing flowers borne often close to or within soil surface (some members of **Viola** and the grass family).

CLINE: gradation of form differences within a species over a geographic area, the variant within the species being a **clinal form.**

CLONE: total of all asexually produced individuals from an original plant, whether produced vegetatively (e.g. by a cutting) or by apomixis. All members of a clone are genetically alike but the effect of a rare seed-production by a member usually is to form a genetically distinct individual. The individual of a clonal line is a **ramet.**

COCCUS: (plural **cocci)** unit of a fruit formed from several united carpels which separate at maturity (characteristic fruit of **Rutaceae).**

COENOCYTE: organism comprising mass of protoplasm undifferentiated to cellular units but including a number of free nuclei (slime molds. See under Fungi), possession by a single cell of two or more free nuclei.

COENOSPECIES: group of ecospecies (q.v.) which, although to certain extent inter-fertile, either do not cross with other coenospecies or produce completely sterile hybrids. Approximates a species, section of a genus or a genus.

COHERENT: attached to, but not fused with, another part or organ of the same kind. Cf. **adherent.**

COLCHICINE: see under **polyploidy.**

COLEOPTILE: cap-like sheaf formed from cotyledon protecting young shoot (plumule) of monocot. seed.

COLEORHIZA: sheaf of tissue surrounding base of radicle within some monocot. seeds.

COLD TREATMENT: see under **stratification, vernalization.**

COLLENCHYMA: thick-walled parenchyma forming supporting tissue making up outer layers of stems (before replacement by secondary tissues), petioles, leaf-midribs, primary and secondary floral axes.

COLLOID: substance forming with dispersal medium a colloidal system, i.e. a two-phase system in which the dispersed phase is held in permanent suspension within the continuous phase (dispersal medium) as an aggregation of molecules. Colloidal systems which are fluid are **sols** many sols form solid but more or less elastic systems known as **gels.** (e.g. agar).

COMMENSALISM: act of living in close association without particular benefit to partners (the commensals).

COMMUNITY: assemblage of plants and their dependent fauna.

COMPANION CELL: parenchyma cell formed from same mother cell as sieve element (q.v.), the two connected by plasmodesmata and dependent on one another for life, the companion cell occurring either singly or in number to each sieve element and frequently coenocytic, otherwise association not fully known.

COMPOST: organic material (e.g. litter, vegetable waste, manure) which may be broken-down in soil to form humus.

COMPOUND LEAF: Leaf entirely divided to separate leaflets, occasionally (as in **Citrus)** reduced to a single leaflet by loss of the lateral ones. May be palmate (leaflets spreading fan-wise) or pinnate (leaflets arranged feather-fashion); when pinnate, leaflets in opposite pairs along axis (rhachis) may be terminated by a single leaflet (imparipinnate) or when terminal leaflet absent, leaf is even, or abruptly, pinnate. Pinnate leaves again may be pinnate (bi-pinnate), the secondary leaflets (pinnules) arranged on a minor axis or rachilla, the primary leaflets then being pinnae (sing. pinna). From the rachilla, a further axis may arise, the leaf than being tripinnate.

COMPOSITE: compound. **Appl.** an apparently simple structure in reality made up of several units as the apparent simple "flower" of a **Compositae** actually an inflorescence of florets. Also applied to category name shown to be made up of two or more distinct taxons (e.g **Leguminosae).**

CONCOLOROUS: the same colour, as a leaf with both surfaces of the same colour intensity.

CONDUCTING TISSUE: tissue functioning for transport and distribution of materials throughout plant body. In higher plants, the **vascular system** (q.v.) made up of xylem and phloem.

CONE: inflorescence characteristic to gymnosperms. See **strobilus.**

CONGENERIC: of the same genus.

CONGLOMERATE: crowded together.

CONIFER: member of gymnosperms (q.v.) characterised by production of non-motile miscrospores and a typical structure shown as a frequently tall, monoecious tree with simple, needle-shaped or scale-like leaves, bearing small

male cones and ovulate cones which become woody. Members included in class **Conopsida.** The families **Podocarpaceae** (most members as **Dacrydium** and **Podocarpus**) and the extra-Australian **Cephalotaxaceae** and **Taxaceae** differ in bearing solitary seed not borne in cones but either on scale-like bracts or with a conspicuous coloured aril often almost enveloping the seed in addition to the frequent occurrence of dioecism and linear or lanceolate leaves. Other coniferous families are **Araucariaceae (Agathis, Araucaria), Pinaceae** (extra-Australian pines), **Taxodiaceae** (one southern representative, **Athrotaxis** of Tasmania) and Cupressaceae **(Callitris**, the Western Australian **Actinostrobus** and the Tasmanian **Diselma).**

CONIFEROUS: cone-bearing. **Appl.** plant communities made up largely of conifers, e.g. the coniferous plantations of exotic conifers (as radiata, cuban, slash pines) in N.S.W.

CONNATION: union of like parts, as the connation of petal-margins to form a gamopetalous corolla, or the union of bases of opposite sessile leaves to form connate leaves **(Eucalyptus perfoliata** a misnomer for the Twin-leaved Bloodwood).

CONNIVENT: converging, or arching over to almost meet.

CONVOLUTE: rolled around, as the rolling of leaf in bud so that one margin covers other. Also to floral parts within bud when margin of each part (sepal or petal) directed inwards and is overlapped, the other margin directed outwards and overlapping margin of an adjacent member, giving a contorted effect to bud.

COPPICE SHOOT: shoot developing from dormant bud of main trunk, particularly from stump of felled trunk. **Cf.** sucker.

CORDATE: heart-shaped, as the broad lobing of a leaf base to form a sinus within which petiole may be inserted (as in **Barklya syringifolia)** or as in **Angophora cordiifolia,** Scrub Apple) petiole may be absent.

CORIACEOUS: of a leathery texture.

CORK: see pericycle.

CORM: bulb-like structure formed by enlargement of stem-base (members of the **Iridaceae).**

COROLLA: second whorl of sterile appendages, petals, of complete flower. When petals separated from each other to bases, corolla termed **choripetalous** or **polypetalous;** when petal margins connate, **gamopetalous** or **sympetalous,** the corolla forming a **tube** with each un-united part of petal termed **lobe** or **tooth** which together may expand radially to form a **limb.**

CORRELATION: mutual relationship e.g. in formation or functioning of a complete organism, relationship of growth of a part or its dimension to growth of other parts and their dimensions.

CORTEX: continuous column of tissue of stem and root, primarily protective layer, bounded on inner periphery by vascular system and on outer by the epidermis; replaced in woody stems by secondary thickening.

CORYMB: racemose inflorescence with flowers brought more or less at one level by a shortening or lengthening of pedicels, the lowermost (and earliest formed) flower being on outside and opening first.

CORYMBOSE: arranged as in a corymb (unit of panicle, **Angophora** and series **Corymbosae** of **Eucalyptus** e.g. bloodwoods).

COSTATE: ribbed longitudinally (fruit of **Eucalyptus bicostata,** Eurabbie).

COTYLEDON: primary leaf developed within seed, functioning for storage and the absorption of nutrient from endosperm. Of a species, number of cotyledons developed normally is fixed (one in most monocots., two in most dicots) from two to fifteen in gymnosperms) **Polycotyledony** noted to occur as normal event in Angiosperms, e.g. Geebungs **(Persoonia** spp.) vary according to species in production of from three to eight cotyledons and for the W.A. Christmas Tree **(Nuytsia floribunda)** usual number is three or four.

COUPLING (GENETIC): condition in linked inheritance (see linkage) by which hybrid heterozygous for two pairs of factors receives the two dominant factors from one parent and the two recessive factors from the other parent.

CRENATE: with rounded teeth on the margin (leaf, Fern-leaf **Heath-myrtle Baeckea crenatifolia).**

CRENULATE: crenate, but with the teeth much smaller (leaf, Blueberry Ash, **Elaeocarpus reticulatis,** Victorian Silver Gum, **Eucalyptus crenulata).**

CROSS: the act or product of a cross-fertilization, i.e. the fusion of gametes contributed by different individuals.

CULM: the jointed stem of a grass, solid only at the nodes, or the solid usually 3-sided) stem of a sedge.

CULTIGEN: plant or group of plants known only in cultivation, apparently originating under domestication.

CULTIVAR: variety or race produced by cultivation, not necessarily referrable to a taxon.

CUNEATE: wedge-shaped, with broad, abruptly-pointed apex tapering to the base (leaf, **Dryandra cuneata**).

CUTIN: mixture of water-impermeable substances, mainly of fatty acids, found chiefly as a covering or **cuticle** to epidermal cells of a plant, usually absent in roots and broken in aerial parts only by stomata and lenticels, contributing in the control of water-loss. Development of cuticle is **cuticularisation**: addition of cutin to a cell wall (e.g. epidermal cells below cuticle) is **cutinisation.**

CYCLOSIS: rotational movement or streaming of cytoplasm within a cell.

CYME: broad, more or less flat-topped inflorescence differing from corymb in that earliest-formed flower is at the centre, opens first, and terminates prolongation of floral stem.

CYMOSE: determinate in flowering by termination of floral stem with a flower. e.g. flowers forming a dichasium, or dichasium modified to a single lateral, flower-terminated branch which gives rise to another single branch and either (a) repeats the unilateral branch order as in a helicoid cyme or (b) repeats the branch order as an alternating series, as in a scorpiod cyme or cincinnus.

CYTOLOGY: science of cell structure, function and genesis.

CYTOPLASM: matrix of cell, bounded by outer membrane, forming complex system of diffusion barriers controlling movement of substances dispersed within. See also organelle, permeable membrane, endoplasmic reticulum.

DAMPING-OFF: disease causing abrupt death of apparently healthy seedlings, induced by soil-inhabiting fungi (as **Rhizoctonia** and **Pythium** spp.) virulent to plant growth under conditions of high humidity and temperature.

DAY-LENGTH: see **photoperiodism.**

DECA-: prefix, **ten** as in **decandrous**—with ten stamens.

DECIDUOUS: shedding at the end of its growth period. **Appl.** plant which does not replace its leaves over a dormant season, contrasting with the **evergreen** which constantly replenishes its foliage throughout the year. Also to barks which periodically are shed, contrasting with **persistent** barks.

DECORTICATION: the shedding of bark.

DECUMBENT: basally prostrate but apically ascending (stems of **Correa decumbens**).

DECURRENT: with base continuous along the stem in form of wing (leaves of **Callitris** spp.).

DECUSSATE: arranged in pairs of opposite members, each pair at right-angles to its following pair, as the leaf arrangement of **Melaleuca hypericifolia** and **M. decussata.**

DEFLEXED: turned or bent downwards.

DEFOLIATION: shedding of leaves either as a seasonal normality or as consequence of severe insect attack or physiological disturbance.

DEHISCENT: splitting open along definite lines.

DEHISCENCE: opening by a process of splitting, When a multi-carpelled fruit splits along lines mid-way to the carpel walls, **loculicidally dehiscent**; when along lines concurrent with the carpel-walls, **septicidally dehiscent.** Other fruits and buds may split in a transverse circular line to cut off a segment **(circumscissile dehiscence)** or split to form pores **(poricidal dehiscence).** Anthers dehisce mainly through longitudinal slit-like openings, a few poricidally. Segments cut off are **valves** and the compartments opened are **locules** (e.g. the seed-containing compartments of a capsule divided off by carpel walls).

-DELPHOUS: suffix, denoting connation of filaments in a flower. **Monadelphous** when filaments united in one bundle, e.g. forming a column as in **Brachychiton** spp. and many members of the **Meliaceae**, **diadelphous** when in two bundles, as in many members of the **Papilionaceae** and **polyadelphous** when in three or more bundles as in **Melaleuca** and **Tristania** spp. **Adelphous** indicates condition when there is no connation, i.e. filaments are distinct.

DELTOID: resembling triangle with equal sides, as a leaf-lobe of **Dryandra calophylla**

DENDRO-: prefix, **tree** as in **dendroid**—treelike; **dendrology**—science of trees.

DENTATE: with saw-like teeth on the margin, the teeth pointing outwards (leaves of **Maytenus bilocularis, Hymenanthera dentata,** etc.).

DENTICULATE: dentate but with teeth much reduced (leaves of **Boronia denticulata**).

DESERT: vegetation form characterised by sparse coverage of annual herbs, low succulent shrubs, larger xerophytic shrubs and hummock-forming grasses.

DETERMINATE: condition of inflorescence when its terminal (central) flower opens first and so terminates further elongation of the floral axis. Cymose.

DEVELOPMENT (ORGANIC): progressive change in nature of an organism, from conception to maturity, with growth as a normally necessary complement.

DIAGNOSIS: concise description of an individual enumerating full distinctive characters.

DICHASIUM: determinate inflorescence in which first pair of branches immediately below terminal flower also are flower-terminated (structural unit of **Tristania** and **Eucalyptus** inflorescences).

DICHOGAMY: maturing of sexual parts at different times, effect being avoidance of self-pollination. See **protandry, protogyny.**

DICHOTOMY: regular division into pairs.

DICOTYLEDON: angiosperm member with most of following characters: two epigeal or hypogeal cotyledons, vascular system forming a continuous cylinder, floral whorls of 5 parts (sometimes 2 and 4), netted venation, root system predominantly branched primary root. Dicots make up a sub-class **Dicotyledoneae** of the class **Angiospermae,** Hutchinson (1959) including in the sub-class some 340 families arranged in 80 orders.

DIFFERENTIATION: elaboration of structure and function, usually as an accompaniment to growth, through specialisation of cells and tissues during development.

DIFFUSE: of open, loosely-spreading habit.

DIFFUSION: tendency of a substance to distribute itself uniformly throughout the space available, from regions of higher to regions of lower concentrations, at a rate independent of other substances which may be present. See **osmosis, permeability.**

DIFFUSION PRESSURE DEFICIT: (DPD-) net tendency of water to diffuse into a cell expressed as difference between osmotic concentration and turgor pressure of the cell.

DIOECIOUS: with flowers borne by an individual of one sex only, i.e. the plant has either pistillate or staminate flowers but not both—the condition of **dioecism.** (Method or recalling distinction from monoecious plant is to apply prefixes monoo- and di- to question—are one or two plants required to effect polliation?) Dioecious members occur in families **Podocarpaceae, Restionaceae, Palmaceae, Moraceae, Lauraceae, Ebenaceae, Sterculiaceae et al.**

DIPLOID: normal chromosome condition of a mitotically-divided nucleus (or somatic nucleus) contrasting with haploid condition brought about at a meiosis by omission of chromosome separation into homologous pairs. The symbol **2n.** is used to denote diploid condition, **n** the haploid. See also Alternation of Generations.

DIPLOID GAMETOPHYTE: phase of gametophytic apomixis (q.v.) in which somatic (mitotic) division within an ovule (see **apospory, diplospory)** forms directly an embryo sac with unreduced chromosome condition.

DIPLOSPORY: formation of diploid gametophyte from a sporogenous cell of an ovule with meiotic division either omitted or modified so that pairing and reduction of chromosomes does not occur. See also **apomixis.**

DISC-FLORET: tubular flower type making up central portion of inflorescence of many **Compositae** members (distinct from outer ray-floret).

DISSEMINATION: dispersal of reproductive structures, disseminules or diaspores (as spores, seed, fruit, vegetative parts) from the parent body by agencies of chiefly wind, water and animal.

DISTINCT: not joined to each other—strictly applied to members of one series.

DIVISION: group of related classes, the highest category of the plant kingdom approximate to the **Phylum** of animal kingdom. No universally-accepted plant kingdom classification but divisions making up the vascular plants considered here as **Spermatophyta** (flowering plants and gymnosperms), **Pteridophyta, Spenophyta, Lycophyta** and **Psilophyta** (making up the **pteridophytes).** See also bryophyte, fungus, algae.

DNA: nucleic acid **deoxyribonucleic acid** forming structure of chromosomes and considered basis for transmission of hereditary and developmental characters controlling cell function.

DOMINANCE (GENETIC): domination of gene (the dominant) of an allelic pair within a chromosome set with an effect of expressing character largely or wholly to exclusion of the complementary **recessive.**

DOMINANT (ecologic): Appl. species or componet with greatest representation in a particular community or layer.

DORMANY: temporary suppression of growth, frequently as feature for survival. Of a seed, due to presence of growth inhibitor or possession of coat impermeable to essential external growth-material. See **stratification, vernalization.**

DORSAL: relating to back or outer surface of organ or part.

DORSIVENTRAL: with upper and lower (or dorsal and ventral) sides structurally different (juvenile leaves of eucalypts).

DRIFT (genetic): irregular variation in the genotype of a population due to random processes.

DRUPE: succulent fruit consisting of fleshy outer wall and hard inner layer enclosing single seed (fruit Geebungs, Persoonia spp. White Cedar, **Melia azedarach** var. **australasica et al.).**

E- or **EX-**: prefix, **without**, as in **estipulate**—without stipules.

ECOLOGY: science of interaction of organisms and their environment. **Autecology** concerns interrelation of the individual and its immediate environment; **synecology** concerns the structure, development and causes of the distribution of plant communities.

ECOPHENE: group of plants, essentially of same genetic constitution, with members differing in appearance and reproductive vigor due to influences of their varying environments.

ECOSPECIES: group of ecotypes (q.v.) which, although interfertile, either do not cross with other ecospecies or produce progeny with reduced vigor. Approximates the taxonomic species.

ECOSYSTEM: equilibrated bioitic system formed by balance of environmental influences with interdependent organic life.

ECOTYPE: individual variant from species in genetic constitution adjusted as response to a particular environment.

ECTO-: prefix, **outside of** as in **ectophyte**—an external parasite.

EDAPHIC. relating to soil as medium for plant growth.

EDAPHON: flora and fauna of a soil.

EGG-CELL: female reproductive cell with nucleus fusing with male nucleus at a fertilization.

ELLIPTIC: of oval surface widest at middle and tapered to rounded ends (leaf of Moreton Bay Fig, **Ficus macrophylla).** Also **elliptical.**

EMARGINATE: with a notch at the apex (leaves of many **Gastrolobium** spp.)

EMBRYO: phase of organic development following initial division of fertilized egg-cell to zygote, or cell formed adventitiously from agamospermy, up to the time of its unfolding (germination) as an individual.

EMBRYOGENY: growth and development of an embryo.

EMBRYOLOGY (plant): science of sexuality, fertilization processes, and embryo development.

EMBRYO SAC: female gametophyte of angiosperms, a tissue containing an egg-cell developed from a megaspore, into which nuclei from a pollen-tube are discharged at a fertilization.

EMERGENCE: outgrowth or appendage formed from cortex or epidermis, e.g. a prickle.

ENDEMIC: confined in natural distribution to a localised geographic area, applied strictly when the element has not yet attained maximum area. **Cf.** relic.

ENDO-: prefix, **inner,** as in **endocarp**—inner layer of pericarp.

ENDODERMIS: uniseriate layer of cells separating stele and cortex in primary axis of plant, the cells with walls incorporating a waxy, water-impermeable substance, See also Casparian strip.

ENDOPLASMIC RETICULUM: an extension of the double-layered membrane of the cell nucleus pervading cytoplasm and commonly associated with microsomes (q.v.). Conceived as a vacuole system with non-protein synthesising enzymes.

ENDOSPERM: layer of cells formed from an initial fertilization within an ovule which, although commonly (as in dicots) absorbed by the developing embryo, may persist up to time of germination of the seed. Frequently referred to as albumin but nature largely of starches and oils.

ENTIRE: with margin unbroken.

ENTOMOPHILY: pollination through agency of insects.

ENVIRONMENT: grand total of the conditions (of soil, moisture, light, temperature et al) under which an organism develops.

ENZYME: organic catalyst of protein constituency, member of vast number of precursors leading living processes through their metabolic pathways. Many linked with non-protein group (prosthetic group) essential to functioning,

the co-enzymes often of complex constitution. Components of specific prosthetic groups are e.g. heavy metals (as iron, magnesium, manganese, zinc) and trace food accessories (as thiamine and riboflavin).

EPACRID: member of the heath family **Epacridaceae.**

EPHEMERAL: lasting for brief period. A plant with a brief life-cycle. See also under xerophyte.

EPI-: prefix, **on** or **upon** as in **epiphyll**—plant growing on foliage units (e.g. a lichen).

EPIBIOTIC: see **relic.**

EPICALYX: pseudo-calyx formed by fusion of stipule pairs or aggregation of bracts subtending a calyx (many **Rosaceae**, **Malvaceae** and some **Sterculiaceae**).

EPICORMIC: developing from an accessory bud. Also proventitious.

EPICOTYL: part of shoot apex within embryo which develops above cotyledonary node.

EPIDERMIS: outermost primary-tissue layer covering entire plant body, broken only by stomata and lenticels, functioning primarily as a controller of water-loss and as protective covering against mechanical injury.

EPIGYNOUS: with floral parts arising from the rim of a floral tube (or receptacle) the tube adnate to the ovary (members of **Myrtaceae**, **Rosaceae**).

EPIGEAL: borne above the ground as cotyledons when forming the first foliage leaves, a character of the dicots. **Cf.** hypogeal.

EPIPETALOUS: borne on, or arising from, petals e.g. stamens of many epacrids and proteads.

EPIPHYTE: plant growing without soil connection and dependent for nutrition on nutrient derived partly from rain-water and its dissolved substances, partly from the decaying surface of host (members of the **Bromeliaceae**, **Orchidaceae**, the dicot. **Fieldia (Gesneriaceae)** many ferns.

ERICOID: with leaves slender, frequently sharp-pointed, and xeromorphic.

ESSENTIAL ELEMENTS: chemical elements making up nutrient essential for plant growth. Carbon, hydrogen and oxygen (derived initially from atmospheric carbon dioxide and water, and from the soil as carbonate and water) make up bulk but small percentage contributed by inorganic minerals derived from soil, and nitrogen (q.v.). See also mineral nutrient.

ESSENTIAL OIL: aromatic, steam-volatile hydrocarbon compound of complex constitution and varying nature, produced by plants in cells or glandular tissue apparently as non-functional by-product of metabolism. Abt. 1% of higher plants ess.-oil secreting, the distribution within families at random but feature of **Pinacea**, **Compositae**, **Umbelliferae**, **Gramineae**, **Labiatae** and **Myrtaceae**—production also by algae and mosses. Australian plants yielding commercially—important ess.-oils for industrial or pharmaceutical application include **Eucalyptus radiata, E. dives, E. fruticetorum, E. citriodora, E. macarthuri, Melaleuca alternifolia, M. bracteata, M. ericifolia, M. quinquenervia, Boronia megastigma, Santalum spicatum.**

ETIOLATION: effect on a green plant from non-production of chlorophyll, growth appearing at a maximum in the elongation of the shoot but with little differentiation, the normally green tissues becoming white or yellow by the unmasking of carotenoids within the chloroplasts, A substance, protochlorophyll, similar to chlorophyll is formed in small amounts and may be converted to chlorophyll when optimum conditions are again established.

EVERGREEN: replenishing foliage throughout the year. Cf. deciduous.

EVOLUTION: see organic evolution.

EXCURRENT: passing beyond, as a mid-rib extended beyond the apex of a mucronate leaf.

EXOCARP: the outer layer of pericarp (q.v.).

EXSERTED: projecting beyond, as stamens and style projecting outside a corolla, e.g. **Correa** spp. et al.

EXTRA-: prefix, **outside of**, or **beyond** as in **extra-Australian**—occurring outside Australia.

EYE: a single bud cutting, or a bud on a tuber.

F_1: the first filial generation: progeny from cross-fertilization of the **P_1** or parental generation.

F_2: the second filial generation from the inter-crossing or the selfing of the **F_1**.

FALCATE: flat, curving and tapering to a point, as the familiar form of a sickle (leaves of a eucalypt when lanceolate and curving, leaves of **Sarcochilus falcatus.**)

FAMILY: group of related genera, or a single genus, subordinate to an order. Large families may be divided into sub-families with the ending **-oideae.** Sub-

families may again be divided to tribes with ending **-eae** and tribes to sub-tribes ending **-inae.**

FASCIATION: abnormal growth in which normally cylindrical structures (stems, petioles, roots) become flattened to form ribbon or thallus like structures.

FASCICULATE: arranged in a fascicle, i.e. a bundle or cluster, as the bundling of stamens in **Astartea fascicularis.**

FASTIGIATE: with branches erect and close together to form a conical or pyramidal shape (Cypress Pine **Callitris muelleri,** Geebung **Persoonia fastigiata).**

FAT: a lipid (q.v.) serving primarily as a reserve food material, dispersed in cytoplasm as a water-insoluble aggregation of globules throughout plant but with particular concentration in endosperm. Formed as ester of fatty acid (mainly lauric, linoleic, linolenic, myristic, oleir, palmitic and stearic acids) with alcohols (**viz.** glycerol). Liquid fats are **fixed oils** (e.g. linseed, peanut, olive, coconut) and some commercial production in Australia has come from cultivated Bush Nut, **Macadamia tetraphylla** (macadamia oil) and the extra-Australian **Aleurites fordii** (tung oil) and **A. moluccana** (candle-nut oil).

FERMENTATION: break-down of organic matter by either organism (as yeast, bacteria) or enzyme, or the incomplete oxidation of carbohydrates and their derivatives by such agents. One form is **anaerobic respiration** whereby a simple sugar is converted through pyruvic acid to lactic acid, alcohol or other product dependent on the activating enzyme, in the absence of oxygen and with release of energy.

FERN: member of class **Pteropsida** (see pteridophyte) with vegetative body a branched or unbranched stem **(rhizome)** from which arise adventitous roots, growth proceeding from one end of the rhizome and from the apices of the branches where leaves uncoil gradually **(circinate vernation)** to mature leaves **(fronds)** made up of a blade attached to a petiole or stipe, Vegetative plant the spore-bearing generation (sporophyte) forming a spore-case **(sporangium)** usually in clusters **(sori)** at the back of leaves, frequently covered by a scale **(indusium).** Spores formed by meiotic division and are first cells of gametophyte generation, their release dependent on hygroscopic changes in a crest **(annulus)** of the sporangium in most, dry conditions creating reversal in curvature so that sporangium is ruptured. Germination of spore on moist site forming **prothallus,** a flat sheet of cells less than half inch in diameter, bearing on undersurface **antheridia** and **archegonia.** Resultant embryo from fertilization of gametes at first nutritionally dependent on gametophyte but developing to structure of vegetative plant. **Classification:** initial separation based on whether sporangia originate from single cell **(leptosporangiate)** as in most **Filicales** or from group of cells as in other orders. Order **Filicales** (royal ferns, gleichenias, tree ferns, polypodiums, climbing ferns, filmy ferns, marsileas et al). In eusporangiate orders, annulus rarely present, the wall of sporangium is thick, and stipules are present on rhizomes. Order **Marattiales** (e.g. **Marattia)** young leaves circinate, stipules thick and not sheafing, sporangia on backs of vegetative leaves in sori. Order **Ophioglossales** (snake's tongue and ribbon fern **Ophioglossum** spp., the grape ferns. **Botrychium** spp.)—young leaves erect, not circinate, stipules thin and sheafing, sporangia separate on specialised leaflets or at the ends of the leaves.

FERRUGINOUS: rust-coloured, as hairs on the leaves of Port Jackson Fig, **Ficus rubiginosa.**

FERTILITY: ability to reproduce or to produce reproductive cells, contrasting with sterility. Also the degree to which soils may supply nutrient for plant growth.

FERTILIZATION: (1) fusion of nuclei from reproductive cells to form a zygote. In angiosperms a double-fusion within an ovule, of male nuclei discharged from a pollen-tube with female nuclei to form a zygote and endosperm. (2) provision of nutrient to soil for absorption by root—soils with adequate amounts of available mineral elements for plant growth are fertile soils.

FIBRE (FIBER): unit of sclerenchyma, a cell elongated and with pointed ends, often long, usually when mature with lignified walls and of non-living nature, serving to make up the strengthening tissues of xylem, phloem and cortex. Within xylem of angiosperm function may be solely supporting (libriform fibre) or both conducting and supporting (fibre-tracheid). Fibres of commerce, usually classed as "bast" fibres, may be from cortex, pericycle or phloem.

FIBROUS ROOTED: with roots of same order with no single root dominant, each root producing lateral roots and so forming a tufted root system.

-FID: suffix, denoting order of branching or dissection of a part as in **bifid,**

trifid-divided into two and three parts respt.

FILAMENT: sterile stalk of stamen bearing anther, ranging in form from thread-like to broad and winged, in length from rudimentary to long.

FILIFORM: thread-like.

FIMBRIATE: fringed, as the central petal of **Dendrobium fimbriatum.**

FLOCCOSE: with woolly tufts, the tufts readily dislodgable (leaves of Australian Dagger-leaf Bush, **Astrotricha floccosa).**

FLOCCULATION: **Appl.** electrostatic attraction of soil-colloids to each other to form loose aggregate, **floccules,** when there is sufficient adsorption of mineral cations. Floccules may be broken up (deflocculated) by high or low extremes of pH and the colloids leached to lower levels in the soil.

FLORA: summation of plant components of a particular geographic area.

FLORAL: relative to a flower or to a flora.

FLORAL CUP: cup-like termination of floral shoot bearing on rim whorls of fertile and sterile appendages making up a flower. Also receptacle, hypanthium, torus.

FLORAL TUBE: floral cup in form of tube, the term for which calyx-tube often incorrectly applied.

FLORET: individual small flower making up head-like inflorescence as in **Compositae:** flower of a grass with its enveloping bracts.

FLORIFEROUS: flower-bearing.

FLOWER: determinate stem-tip bearing appendages specialised for reproduction; in gymnosperms forming a strobilus, in angiosperms modified to perianth, androecium and gynoecium, borne on a receptacle. Development of angiosperm flower parallels development of a leafy shoot, the growth region concerned being an apical but determinate meristem, the floral units being foliar in origin, the internodes of the floral shoot very much reduced or obliterated.

FOLIACEOUS: resembling a leaf in form and texture.

FOLIAGE: collective term for leafy units (leaves, leaf-buds and their associated structures) making up crown of leaf-bearing plant.

-FOLIATE: suffix, denoting (with combination) number of segments making up compound leaf (e.g. a trifoliate leaf has 3 leaflets). A unifoliate leaf, through loss by reduction, composes a solitary leaflet.

FOLLICLE: dry fruit formed from single carpel containing more than one seed and splitting open along definite lateral line (suture) (fruit of **Brachychiton, Telopea, Stenocarpus, Grevillea** spp **et al.).**

FOLVEOLATE: pitted, indented with small cavities or depressions (leaves of **Cryptocarya foveolata).**

FORM: (or **forma)** smallest taxon, referrable to trivial variation from typical species as in flower-colour, pubescence or habit. Also **race.**

FREE: not joined to other organs or parts; strictly applied when members are not of same order. **Cf.** distinct.

FROND: mature leaf-blade of fern.

FRUIT: mature gynoecium together with accessory structures when present. **Dry fruit:** fruit differing from fleshy (or succulent) fruit in greater abundance of sclerenchyma, the cell-contents drying-out during ripening and the walls frequently becoming lignified or suberised. A fruit formed from several flowers (cone-like mass of samaras of **Casuarina** spp. and cone-like mass of follicles in many **Proteaceae** (e.g. **Banksia)** is a multiple fruit. When formed from several un-united carpels within a gynoecium (many **Rutaceae** as **Melicope** and **Euodia** spp.) fruit is an aggregate fruit.

FRUTESCENT: woody, or with character of a shrub. Also fruticose, e.g. the naturalised weed Arghel of Syria **Gomphocarpus fruticosus.**

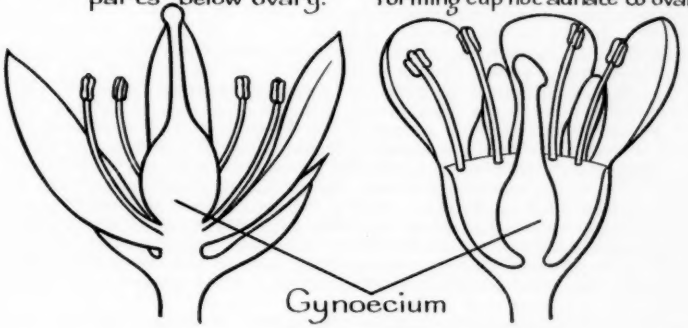
FUGACIOUS: falling or withering away almost immediately after development. Also caducous.

FUNGUS: (plural fungi) plant devoid of chlorophyll hence necessarily saprophytic or parasitic for nutrient. Nature of fungi given in broad classification following: Division **Schizomycophyta**—bacteria. Members single-celled, microscopic, reproducing by binary or transverse fission (splitting). Division **Myxomycophyta**—slime molds. Members naked masses of protoplasm (coenocytic) often of macroscopic size, reproducing by enclosed sporangia producing asexual spores. Division **Eumycophyta**—true fungi. Class **Phycomycetes**—algal fungi. Members varying from simple masses of protoplasm to branched, well-developed systems of filamentous hyphae making up a mycelium, reproducing mainly by spores from sporangia or conidia, the spores sexual in higher members. Class **Ascomycetes**—sac fungi. Members with partitioned (septate) hyphae, producing sexual spores in sacs or asci and asexual spores in conidia—including yeasts and most

NATURE OF THE ANGIOSPERM FLOWER

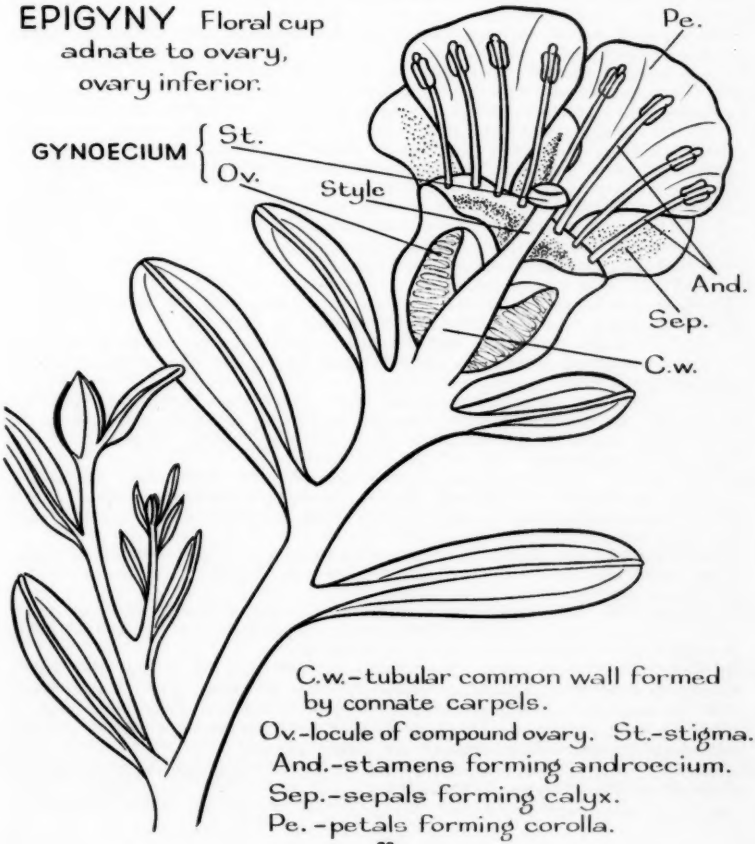
HYPOGYNY Insertion of parts below ovary.

PERIGYNY Receptacle forming cup not adnate to ovary.



A DETERMINATE STEM TIP BEARING SPOROPHYLLS

EPIGYNY Floral cup adnate to ovary, ovary inferior.



C.w.-tubular common wall formed by connate carpels.
Ov.-locule of compound ovary. St.-stigma.
And.-stamens forming androecium.
Sep.-sepals forming calyx.
Pe.-petals forming corolla.

molds. Class **Basidiomycetes**—basidia fungi. Members producing sexual spores in basidia, in higher members frequently in conspicuous fruiting-bodies of toadstool, mushroom, conk and puff-ball types, mycelia well-developed and with septate hyphae. Class **Deuteromycetes (Fungi imperfecti)**, hyphae-forming members with flexual phase absent or not known.

FUNICLE: basal stalk of an ovule or seed.

FURCATE: forked, as the venation of ferns.

FUSIFORM: spindle-shaped: circular in cross-section, broadest at centre and tapered evenly to ends.

GALL (ORGANOID): abnormal growth of cambium resulting in aborted organ or organ-like structures (as those found on coccid-infested eucalypts and wattles) or conspicuous thickenings of parts (as bulbous stem of citrus caused by cynapid wasps). Besides parasitism, causatives may be nutritional or hormonal disturbances. In parasitism, mechanism somewhat reminiscent of action of carcinogen within animal tissue, e.g. feeding of coccid larvae on plant tissue perhaps introduces a secretion causing over-stimulation of growth substance controlling tissue development, or secretion itself may act as growth stimulant—in such case structure of aborted tissue becomes integral part of life history of parasite. Changes such as conversion of stamens and carpels to petal-like structures are resultant of nutritional or hormonal disturbances. See also tumor.

GAMETE: reproductive cell or nucleus, fusing with its complement at a fertilization to form a zygote.

GAMETOPHYTE: gamete-producting haploid phase of a life-cycle, normally arising from a haploid cell formed at a meiosis from a diploid sporophyte. See also diploid gametophyte. The female gametophyte of angiosperms is an embryo sac.

GAMO-: prefix, **united** as in **gamosepalous, gamopetalous**—with sepals and petals respt. connate.

GEL: see under colloid.

GENE: self-duplicating unit of inheritance located in chromosome, recognised by constant effect on an individual for a particular character, and remaining relatively unchanged from cell-division to cell-division and from generation to generation, occasionally changing in structure (mutating) and producing a variant effect on progeny receiving the mutated gene. Current concept on role of gene in living processes is that it is directive force of a selective mechanism determining kind and amount of protein synthesised within cell, the specificity of protein formed having fundamental effect on differentiation of cell. See also chromosome, mutation, nucleic acid.

GENERATIVE: concerned in reproduction.

GENERIC: relative to a genus.

GENESIS: development of cell, tissue, organ, organism or its species.

GENETIC: relative to heredity, or to factors of heredity.

GENETICS: science of causes and effects of inheritance and variation, and the factors determining similarities and differences among individuals related to one another by descent.

GENOME: complete set of chromosomes inherited from one parent as a unit.

GENOTYPE: genetic constitution of an individual, the sum-total of all its genes, contrasting with the manifestation of those genes visibly expressed in the individual (phenotype).

GENUS: group of related species, or single species, subordinate to family, designed to show natural affinity besides providing convenient grouping as an aid to identification. Minor divisions, in descending order, are section, subsection, series, species.

GEOTROPISM: plant growth response, effected by a bending towards or away from gravitional field of the earth. Roots are positively geotropic, stems negatively geotropic.

GERMINATION: phase of plant development in which individual emerges from embryo or dormant stage. Applied also to production of a pollen-tube by a pollen-grain on reception by a stigmatic surface.

GIBBERELLIN: growth substance originally derived from the ascomycete fungus **Gibberella fuiikevroi** causing a disease of rice in Japan from which many different substances called gibberellins have been purified—these have marked effect on stem elongation and stimulation of flowering in many plants. Closely related substances isolated from many higher plants.

GLABRATE: hairy at first but losing hair with increasing age (indumentum of Leafy Purple-Flag **Patersonia glabrata).**

GLABROUS: without hairs.

GLAND: a single cell, or group of cells within a tissue, frequently a cavity from breakdown of localised cells, or the tip of a hair, functioning as a collector of specific secretions. See lysogenous, schizogenous.

GLAUCESCENT: somewhat glaucous, or losing bloom with age (phyllodes of **Acacia glaucescens** et al.)

GLAUCOUS: covered with whitish or bluish "bloom" or finely-divided wax particles on surface of cuticle (leaves of **Eucalyptus cinerea, Acacia podalyrifolia** et al.).

GLOMERATE: in compact clusters, e.g. fruit of **Melaleuca glomerata.** Also glomerulate.

GLUME: bract subtending inflorescence of a grass.

GLUTINOUS: with a sticky or adhesive surface.

GYLCOSIDE: water soluble organic substance which yields a sugar (e.g. glucose) on hydrolysis. Dispersed throughout plant tissues probably as a reserve food material, a means of removing from metabolic activity waste material, an intermediary in a metabolic pathway, or perhaps with some parasite-inhibiting influence. May be member of one of main groups: **cynaphoric** (cyano-genetic) **glycoside**, yielding hydrocyanic acid on hydrolysis with acid or enzyme Rosewood, **Heterodendrum oleifolium**, Native Fuchsia, **Eremophila maculata**, several spp. Sorghum as Johnson Grass, **Sorghum halapense**, spp. of couch as Blue Couch **Cynodon incomplus**, and caustic weed **Euphorbia drummondii.**: **mustard** oil **glycoside**, on hydrolysis yielding a mustard oil containing a thiocyanate group **(Cruciferae** members as weeds White Mustard **Brassica hirta** and Black Mustard, **B. nigra** and the cultivated Rape, **B. napus): saponins**, which form soapy foams and stable emulsions with oils, fats and resins (immature seeds of Black Bean, **Castanospermum australe**, foliage of Whitewood, **Atalaya hemiglauca**, Red Ash **Alphitonia excelsa** et al): **phenolic glycoside** (anthocyanins [q.v.], and **rutin** commercially extracted from foliage of **Eucalyptus macrorhyncha**, Red Stringybark and **E. youmanii**, Youman's Stringybark): coumarin glycoside **(aesculin** commercially extracted from the common black-thorn **Bursaria spinosa).** Phenolic and coumarin glycosides yield on hydrolysis aromatic compounds, chiefly phenols, all with a phenolic grouping.

GRAFT: small shoot (scion) or bud vegetatively propagated by union of its cambium with the cambium of a larger rooted plant (stock) through the inter-mingling of calluses formed on the wounded surfaces of the severed stock and scion. Graft-union (grafting) usually between members of same or closely related species, but inter-family union on record. Stock appears to have metabolic and nutritional influence on scion but no evidence to show permanent genetic effect on either. See chimera. The process of forming a graft is a grafting. Natural grafting is frequent, a union of tissues from two distinct individually-rooted plants possible by close and constant contact during growth.

GROWTH: process by which plants increase in size and green weight, a process dependent on the ability of their structural units, cells, to divide and enlarge.

GROWTH SUBSTANCE: (growth regulator, plant hormone)organic substance formed in relatively small amounts in localised regions of plant, transported to site where effect of acceleration or inhibition directed on variety of growth processes ,e.g. thiamine and nicotine acid produced in leaf are stimulators of root growth). Collective name **auxin** given to such substance, each auxin referrable chemically to 3-indolacetic acid. Not all show typical "chemical messenger" effect for some activate or retard processes within formation site, nor is there predominant specific effect for many control multitude of processes in several places. Many synthetic substances produce growth effects: 2, 4-D (2, 4 dichlorophenoxyacetic acid) noted selective herbicide and controller of fruit-drop and may be absorbed by leaf in small amounts, alpha-naphthalene-acetic acid and indole butyric acid of value for rooting cuttings and in inhibiting fruit drop of apples and pears; colchicine has marked effect on genetic constitution by inducing polyploidy (q.v.); beta-napthaoxyacetic acid used effectively in induction of parthenocarpy. See also gibberellin.

GUM: product of gummosis (q.v.), a sugary, colloidal substance which in water either dissolves completely or swells **(Cf.** kino). Product of commercial value for various industrial and pharmaceutical uses(as adhesive, in paper-making techniques, as stabilizer in ice-cream mixes et al) chiefly as Guar Gum (from **Cyamopsis tetragonoloba),** Gum Tragacanth (fr. **Astragalus gummifer)** and Gum Arabic (fr. various species of wattles). A number of Australian wattles have been exploited for their gums (Wattle Gum) but low viscosity in water solution or dispersion has made extraction secondary to tan-bark production. Chief sources in Australia are **Acacia pycnantha, A. decurrens,**

A. mearnsii, A. dealbata, A. sentis, A. homalophylla.

GUMMOSIS: condition frquently but not necessarily associated with disease from parasitic or physiologic cause occurring with decomposition of cellulose causing disintegration of internal tissue, the product exuded and setting to solid, clear or amber-coloured mass.

GUTTATION: escape of water and dissolved salts through hydathodes (q.v.) under conditions favouring rapid absorption of water by roots but resulting in reduced transpiration rate or closure of stomata (as in late spring when often sharp demarcation in thermoperiodism gradient, guttation occuring at night or early morning).

GYNOSPERM: member of plant division **Spermatophyta** separated from class of flowering plants, **Angiospermae**, by representation of flower as strobilus or cone, and the production of unenclosed ovules (and seeds) on specialised leaf, bract or scale of the cone. See under Class for classes making up gymnosperms and under **conifer** for a major class.

GYNA- or GYNO-: prefix, female as in **gynandry**—fusion of stamens with carpels.

GYNOECIUM: female, ovule-bearing part of flower made up of carpels or a single carpel, syncarpous when the carpels are fused to one another, apocarpous when of a single carpel or of two or more un-united carpels.

GYNOPHORE: elongated part of receptacle bearing entire gynoecium as in **Brachychiton** and **Telopea** spp. et al. Cf. stipe, carpophore.

GYNOSTEMIUM: column-like structure formed by fusion of stamens to style/s and stigma/s, a character of families **Orchidaceae** and **Stylidiaceae.** Also gynandrium.

HABIT: general form or appearance of plant conventionally designated as tree, shrub, undershrub, herb, vine, etc. for flowering plants but all types merge with others. Herbs may have woody stems or be tree-like in stature, trees are not always woody; vines may be herbaceous or woody. Tree habit considered primitive condition in angiosperms and present-day tree species approximate ten per cent of total species.

HABITAT: site of a particular environment in which an organism or its population develops. In literature frequently denoted by combination with suffix—**phyte**, as in **aulophyte**—non-parasitic, growing in hollow of another; **chasmophyte**—dwelling in rock crevices; **chasmochomophyte**—on detritus in rock crevices; **epiphyte**—on surface of another; **halophyte**—in alkaline or saline soils; **helophyte**—in marshes; **hydrophyte**—on or in water; **hygrophyte**—in moist or marshy ground; **mesophyte**—under temperate conditions; **myrmecophyte**—in association with ants and with special adaptations for housing them; **petrophyte**—on rocks; places; **hylophyte**—in woods; **limnophyte**—in ponds, **lithophyte**—on rocky sites; **pholadophyte**—in hollows, avoiding bright light; **psammophyte**—on sand or gravelly ground; **psychrophyte**—on a cold substratum; **tathrophyte**—in ditches; **thermophyte**—in warm places. For other use of suffix **-phyte** see under perennation.

HAIR: third rank appendage (trichome), formed from an epidermis, which may be functionless, secretory (as in **Drosera** and **Laportea** spp.) or assist in pollination etc.

HALOPHYTE: plant which displays wide tolerance to saline environment (e.g. salt marsh) or alkaline soil. Some are able to adjust physiology when introduced to such an environment and are **faculative halophytes**, the true halophytes are those which naturally occur to a degree varying with the alkalinity or salinity of the environment.

HAPLOID: with a single set of unpaired chromosomes in the nucleus. See **meiosis.**

HARDENING: temporary adaptation for immunity to low temperature injury which may be induced by a sudden check in growth through exposure to cold and reduction in water supply.

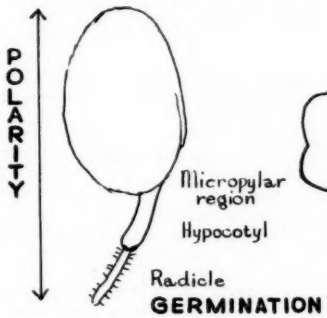
HASTATE: shaped like an arrow-head (sagittate) but with base lobed and divergent (a leaf of Golden Goosefoot, **Chenopodium auricomum, Pavonia hastata** etc.)

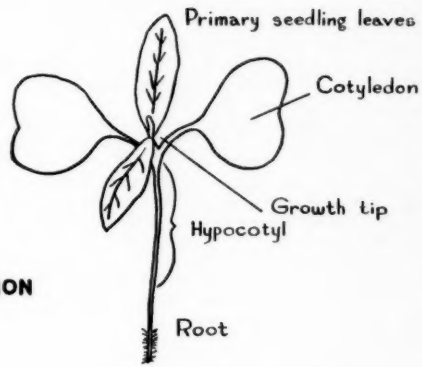
HAUSTORIUM: penetrating and absorbing organ of a parasitic angiosperm or a hyphal branch of a parasitic fungus by means of which mineral nutrient and water are withdrawn from a host (e.g. haustoria developed by mistletoes and sandalwoods).

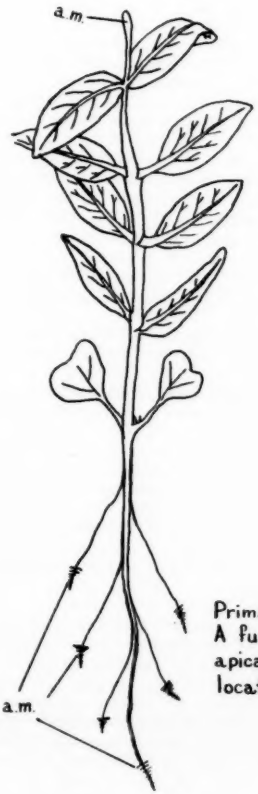
HEAD: cluster of sessile (or sub-sessile) flowers, essentially a spike with a much reduced foral axis (characteristic inflorescence of wattles et al).

HELIOPHYTE: plant attaining optimum growth in full sunlight; when tolerating shade as well, **faculative heliophyte**, when not tolerating shade,

GROWTH AND DEVELOPMENT







Primary Growth
A function of apical meristem located at points a.m.

Origin of secondary shoots - from naked buds in axils of leaves

obligate heliophyte.

HEATH: plant community dominated by erect low shrubs and undershrubs with small sclerophyllous leaves—characteristic of acid soils with low nutritional status.

HEMICELLULOSE: constituent of secondary wall of all woody tissue cells and many tissues of grasses, accompanying cellulose. Both constituents may be replaced by such materials as lignin, suberin and inorganic substances.

HERB: flowering plant without woody tissue, dying back to the ground at the end of its growth period.

HERBACEOUS: without woody tissue.

HERBACEOUS PERENNIAL: herbaceous plant which dies back to the ground at the end of a flowering period and, after a dormant period, regenerates, repeating the cycle from year to year.

HERBAGE: vegetative parts of a herbaceous plant.

HERBARIUM: collection of plant specimens, preserved in some manner, tabulated and available for reference.

HEREDITARY: transmissible from parent to progeny.

HEREDITY: resemblance among individuals related by descent.

HEREDITABILITY: degree to which alternative changes in gene constitution affect the individual compared with the effect of environmental modification.

HERMAPHRODITE: bisexual, applied to a single flower.

HETERO-: prefix, **various** or **of more than one kind** as in heterocarpous—producing more than one distinct type of fruit. e.g. Bitter Cress **(Cardamine)** spp. produce minute, oval pods from cleistogamous flowers additional to normal linear pods.

HETEROGAMOUS: of a plant with two or more types of flower (e.g. with bisexual flowers in addition to unisexual ones, as in **Brachychiton** spp.) Also polygamous.

HETEROPHYLLOUS: bearing leaves of more than one kind or shape (most eucalypts, and the Flame Tree **Brachychiton acerifolium).**

HETEROSIS: property of an F_1 hybrid displaying one or more characters in greater degree than either of its parents due to recombinations of dominant and recessive genes. Frequently manifested as an increase in vigor or fertility and term has become a synonym of **hybrid vigor.**

HETEROSTYLY: of a flower with stamens and styles of 2 or more different lengths.

HETEROZYGOUS: possessing unlike genes (alleles) in corresponding loci of chromosome set. Unless one gene is dominant to recessive, expression of factor will show in hybrid (the **heterozygote)** as a character intermediate to the individual characters of the alleles. **Cf. homozygous.**

HEXA-: prefix, six, as in hexacyclic—with floral whorls of six parts.

HEXOSE: see under sugar.

HILUM: scar on a seed marking earlier attachment to funicle within ovary.

HIRSUTE: with rather coarse and stiff hair (Hairy Blue Lupin, **Lupinus hirsutus).**

HISPID: with rigid or stiff bristles or bristle-like hairs (juvenile leaves of Lemon Scented Gum **Eucalyptus citriodora,** leaves of the Rough Maidenhair Fern **Adiantum hispidulum).**

HOMO-: prefix, **similar** or **alike** as in **homochlamydeous**—with perianth parts alike. Also **Homeo**—as in **homeostasis**—the regulatory process maintaining physiological organisation at a constant level.

HOMOLOGOUS: of an organ similar in structure and/or position to another organ shown especially during embryonic development. Applied also to chromosomes forming a bivalent by possession of the same sequence of genes.

HOMONYM: name applied to taxon which has been shown to have had earlier application to some other taxon (i.e. it is a preoccupied name)—by rules of nomenclature such a name is not acceptable as a taxon.

HOMOZYGOUS: having identical genes in corresponding loci of chromosome pairs, the character expressed in the **homozygote.**

HORMONE: see growth substance.

HUMIDITY: water vapor content of the atmosphere, usually expressed as relative humidity i.e. percentage of vapor present to maximum quantity of vapor air can hold at the prevailing temperature. The gradient of relative humidity is a condition of transpiration from a leaf surface.

HUMIFICATION: process of humus formation.

HUMUS: finely divided organic matter from decomposed vegetable litter together with the mineral material with which it is incorporated in the soil. Composed chiefly of the organic residues of the litter which have resisted decay the

longest and the organic wastes synthesised by soil-inhabiting micro-organisms.

HYALINE: transparent or translucent whn viewed in transmitted light.

HYBRID: progeny resulting from a cross-fertilization of parents with unidentical genetic constitutions (different genotypes). Process of hybrid production is hybridization, known hybrids being indicated by an X as in **Eucalyptus X westoni,** a non-taxon name for a composite of characters contributed by the natural hybridization of **E. mannifera** var. **maculosa** with **E. goniocalyx** and hybridization at generic level (to form bigeneric hybrid) as in **X Solidaster luteus,** a cultigen formed by a cross of cultivars of **Aster** and **Solidago** species. In herbarium practice, natural hybrids placed under one of parents as **E. m.** var. **maculosa x E. gonicalyx.**

HYBRID SWARM: population formed by segregation of hybrids of back-crossed or self-pollinated, interspecific F_1 hybrids.

HYDATHODE: pore-like, water-excreting gland on leaf-margin of many plants connected with tracheids of vascular bundle ends within leaf. See guttation.

HYDROCHORE: plant reproduced by, and reproducing by, water dissemination (an aquatic).

HYDROLYSIS: splitting of a compound by its reaction with water, frequently activated in cell metabolism by enzyme e.g. the hydrolysis of starch to maltose when activated by enzyme amylase.

HYDROPHILY: pollination through agency of water, the normal method of the Fragrant Water-weed **Halophila ovalis.**

HYDROPHYTE: plant normally growing in or on water or on soils with abnormally high moisture content (a bog plant).

HYGROPHYTE: plant intolerant to dry air (e.g. a high-humidity loving fern).

HYPANTHIUM: a floral cup or tube.

HYPER-: prefix, **above** or **more than** as in **hypertonic**—with an osmotic concentration greater than that of another solution.

HYPO: prefix **under** or **below** as in hypotonic the converse of hypertonic.

HYPOCOTYL: region of axis of embryo and seedling below cotyledons marking transition of root and stem development.

HYPOGEAL: borne underground as the cotyledon of a monocotyledon remaining underground when the seed germinates **Cf.** epigeal.

HYPOGENOUS: with floral parts arising directly from tip of floral stem without formation of a floral cup, the ovary thus being superior to the floral whorls.

IMBRICATE: overlapping, as the arrangement of floral parts within bud when floral leaves (sepals, petals) overlap. **Cf. valvate.** A major distinction of **Parsonsia** (imbricate) from **Lyonsia** (valvate) is in aestivation. Also placement of scale-like leaves on stem so that they appear shingle-like.

IMPARI-PINNATE: pinnate and with a terminal leaflet (Teak, **Flindersia australis).**

INBREEDING: breeding through a succession of parents of same stock.

INCISED: cut deeply into segments.

INCLUDED: not projecting above surrounding surface. **Cf.** exserted.

INDEHISCENT: not opening or not opening along definite lines.

INDEPENDENT ASSORTMENT: random assortment to gametes of alleles, the members of one allele pair having no influence on the distribution of members of another pair. See also linkage.

INDETERMINATE: of indefinite or protracted growth as an axis of an inflorescence (racemose) not terminated by a terminal flower.

INDIGEN: a native to a specific area.

INDIGENOUS: native to a specific area. Autochthonous.

INDUMENTUM: a covering of hairs.

INDUPLICATE: with the edges folded or rolled inwardly.

INFERIOR: below. **Appl.** ovary adnate to floral tube with the floral leaves arising from rim of tube.

INFLEXED: incurved, turned or bent inwardly as the stamens of **Crowea** and **Eriostemon** spp.

INFLORESCENCE: method of flower-bearing more commonly in reference to that part of branching system of stem which carries the floral units as more or less definite segregates. See also determinate, indeterminate, cauliflory. In addition to these terms, an inflorescence may be termed **terminal** when it terminates the branch, **axillary** when it is terminal on a short axillary branch or replaces a short leafy-shoot (in this case also **lateral**—terms includes the supra-axillary inflorescence which arises from the stem above a leaf axil); **intercalary** when the inflorescence is at first terminal but growth of the axis is later continued as a leafy shoot above (as the spike of many **Callistemon** and **Melaleuca** spp.).

INFRA-: prefix, **below** or **subordinate** to as in **infra-specific**—subordinate to species level, as taxons variety (sub-species) and form.
INHIBITION: suppression of a phase of growth or development.
INSECTIVEROUS: see carnivorous.
INSERTED: attached to another organ, as a stamen attached to rim of floral tube.
INSOLATION: exposure of a surface to radiant heat from, e.g. sunlight.
INTEGUMENT: outer covering of an organ, more frequently the outer tissue, forming one or two layers, of an ovule which becomes the seed coat.
INTER-: prefix, **between**, as in **inter-breeding**—cross-fertilisation; **interfertile**—capable of being crossed (genetically compatable); **iniercellular**—between cells.
INTERCALARY MERISTEM: growth point at base of internode, accessory to apical meristem of many monocots (as grasses) actively dividing to effect elongation of each internode when apical growth has ceased. Localised meristem—intercalary leaf meristem—also common in both monocots and gymnosperms but usually short-lived (in **Welwitschia** indeterminate). Application of term extended to include any growth region between regions of permanent tissue, e.g. meristem giving rise to petiole development.
INTRA-: prefix, **within** as in **intraspecific**—within a species, i.e. relative to members of a species.
INTROGRESSIVE HYBRIDIZATION: partial gene exchange among population immediately prior to complete isolation (q.v.), the change in genotype frequently being an adaptive advantage to the changed environment.
INTRORSE: turned inwards, towards the axis.
INTUMESCENCE: pustule formed by abnormal growth of cell-group at surface of an organ.
INTUSSUSCEPTION: growth by addition of new particles among those already in in position.
INVOLUCRE: one or more whorls of bracts at base of single flower or flower cluster.
INVOLUTE: rolled inwardly or towards upper side. **Cf.** revolute.
IONIZATION: electrolytic dissociation in solution of substance (electrolyte) to atoms or groups of atoms, ions, in equal concentrations of acid (as positively-charged cation) and basic (negatively-charged anion) radicals of which the electrolyte is composed. Inorganic acids, bases and salts are electrolytes, most organic compounds are non-electrolytes. See absorption, adsorption, anion, cation, diffusion, oxidation-reduction.
IRREGULAR: with members of the same series within a flower different in form or size from one another. **Cf.** zygomorphic.
ISO-: prefix, **equal**, as in **isomerous**—with equal numbers of different parts.
ISOBILATERAL: with the same structure on either side, as the mature leaves of eucalypts compared with the dorsiventral nature of their juvenile leaves.
ISOLATION: segregation of previously interbreeding populations into two or more segments so that each segment behaves independently in methods of adaptation and reconstitution of genes, the effect being an evolution of the segments along divergent lines leading to formation of ecospecies or to speciation. The barrier, or isolating mechanism determining the segregation may be either external (such factors as geographic or ecologic conditions which prevent or reduce frequency of cross-pollination between segregating populations) or internal (factors such as hybrid sterility which affect the individual within the population. See also drift (genetic).
JUVENILE LEAVES: secondary leaves which appear after seedling leaves, usually differing from later-formed adult leaves in form and size. Some species retain juvenile condition in their mature leaves **(Eucalyptus pruinosa, E. cineria, E. melanophloia, Angophora subvelutina** et al).
KARYO: prefix, **nucleus**, as in **karyology**—cytology of the nucleus.
KARYOTYPE: phenotypic expression of somatic chromosomes in contrast to their genetic content (as number and size of chromosomes).
KEEL: ridge on outside of a fold. Applied also to the two united lower petals of papilionaceous flower.
KINO: tannin-containing resin exudate of certain trees (e.g. **Eucalyptus** and **Angophora)** appearing as a gum-like, brown or reddish, jelly or glassy mass on bark. Its astringent property has some pharmaceutical use, River Red Gum, **Eucalyptus camaldulensis** providing a commercial source.
LABELLUM: a lip, or the inner lip-like petal of e.g. an orchid flower.
LABIATE: lipped as the bi-labiate corolla characteristic of the labiate family **(Labiatae).**

LABILE: unstable, as a metabolic product readily converted to another form under appropriate conditions.

LACERATE: cut irregularly as though slashed.

LACINIATE: cut into narrow, more or less equal, segments.

LACTIFEROUS: producing or storing latex or other milky secretion. Also laticiferous.

LACUNA TISSUE: parenchyma with enlarged intercellular spaces (lacunae).

LAMELLATE: composed of thin plates or sheets.

LAMINA: a blade or expanded part as that of a leaf or petal.

LAMINAR: relative to or resembling a leaf-blade.

LANATE: with long woolly hair as the indumentum of Woolly Patersonia, **P. lanata.**

LANCEOLATE: lance-shaped; widest at mid-line and tapered to acute apex, at least three times longer than broad (leaf, **Eriostemon lanceolatus** etc.)

LATERAL: on or at the side of, as the unilateral flower arrangement forming inflorescence of **Calothamnus quadrifidus** or the lateral meristem of cambia by which thickening around a primary axis is initiated.

LATICIFER: specialised cell containing in its vacuole a latex. Member of a series of individual cells or a series forming a continuous latex-vessel, or a single coenocytic cell elongated to considerable length and forming a latex-tube.

LATEX: constituent of cell-sap contained in latificer, variable in nature according to latex-secreting species but may contain carbohydrates (sugars and starches), protein, alkaloids, organic acids , mineral salts, fats, sterols, tannins,mucilages, tannins, resins, commonly rubber, dispersed in a watery serum. Production widely distributed in plant kingdom and in addition to monocots and dicots has been reported from fungi and ferns. Australian native plants secreting latex include (most are alkaloid containing) the Bitter Barks **Alstonia constricta** and **Ervatamia angustisepala**, Milky Pine **Alstonia scholaris (Apocynaceae)**; Cunjevoi **Alocasia macrorrhiza (Araceae)**; Milk Weed **Euphorbia drummondii** and the introduced Petty Spurge **E. peplus**, Milky Mangrove **Exoecaria agallacha**, Brush Poison Tree **Excoecaria dallachyana (Euphorbiaceae)**; Whalebone Tree **Pseudomorus pendulina** var. **australiana**, Crow Ash **Malaisia scandens (Moraceae)**; **Black Apple Planchonella australis (Sapotaceae).** Latex of extra-Australian plants has yielded commercial rubbers (caoutchouc, gutta percha), chicle (source of chewing gum), proteolytic enzymes papain (from Papaw **Carica papaya)**, ficin (from **Ficus** spp.) and **asclepain (**from several Milk Weeds **(Asclepias** spp.).

LEACHING: displacement of soil-solutes by water-percolation as, e.g. the replacement of exchangeable cations with hydrogen ions in soil subject to heavy rainfall, the effect being an increase in acidity of the soil and consequent diminishing in availability of cations to roots.

LEAF: photosynthetic organ of vascular plants forming with the stem an integrated system, the shoot, concurrently derived from the shoot apical meristem, the leaf from a lateral crescent-shaped leaf-buttress which becomes a leaf primordium. In structure typically a single flattened blade of varying form and division, supported from the stem by a petiole and continuous with the stem by a vascular system which extends as a venation throughout the lamina. Besides role as photosynthetic agent, leaf also functions for water loss from the plant by evaporation (transpiration), shows higher level of respiratory activity than do other parts and, through stomata or cuticle, provides an accessory system of exchange with the atmosphere of solutes important in the control of salt metabolism and moisture relationships within the plant (foliar absorption and leaching of nutrient). Leaf meristem may remain diffuse to conform the lamina to a simple shape, or become localised to differentiate the lamina to varying degrees of lobing or clefting (see also compound leaf). Stipules and stipels (of leaflets) may also be cut off from the lamina.

LEAFLET: segment of compound leaf appearing as an entire leaf.

LEAF TRACE: strand of conducting tissue forming extension of primary vascular bundle from stem to leaf, the point of departure of the trace from the stem being marked by a break, **leaf-gap**, in the bundle around and above the trace.

LEAF-SCAR: site at a node of leaf abscission.

LEGUME: dry, several-seeded fruit formed from a unicarpellate ovary, dehiscent along both sutures. Characteristic fruit of the composite family **Leguminosae** which includes the currently accepted segregates **Mimosaceae (Acacia** family), **Caesalpinaceae (Cassia** family), **Papilionaceae** (pea family) and the monogeneric **Krameriaceae** (the American ratany, **Krameria).**

LENTICEL: space or pore in periderm of most plants (stem, many roots and fruit) functioning as passageway for gaseous exchange (and probably external

solute exchange) between inner tissues and the external amosphere.

LENTICULAR: lens-shaped.

LEPTO-: prefix, **slender**, as in **leptophyllous**—with slender leaves.

-LET: suffix **dimunitive of** or **smaller** as in **branchlet**—a secondary or tertiary branch.

LEUCOPLAST: see plastid.

LIANA: (plural lianes) woody vine, rooted in ground, making use of erect established plant for support, not parasitic on host's tissues but frequently creating lethal effect by strangulation of host's conducting tissues. Feature of tropical and sub-tropical rainforests (Lawyer Vines **Calamus** spp., Monkey Vine **Lyonsia reticulata**, Water Vines **Vitis** spp., Wonga Vine **Pandorea pandorana** et al).

LICHEN: dual organism formed by symbiotic association of one or more fungi (usually an ascomycete) with one or more unicellular green or blue-green algae—an important primary coloniser of bare areas e.g. a rock surface.

LIFE FORM: habit developed by organism as an adaptation to its microenvironment. See also perennation.

LIGNIFICATION: secondary thickening of cell wall by deposition of lignin.

LIGNIN: highly resistant, chemically complex cell wall constituent characterising woody tissues. Sometimes in combination with cellulose as **lignocellulose** but not of carbohydrate origin.

LIGNEOUS: woody in nature.

LIGNOTUBER: conspicuous swelling at base of a stem (e.g. of eucalypt) at or below soil level, functioning for food-storage and bearing latent buds with capacity for regeneration of new shoots. An adaptive feature for survival, the development of the dormant buds to suckers being stimulated when the stem above is destroyed e.g. by fire.

LIGULE: strap-shaped organ or part as the corolla of a ray floret **(Compositae)** or part of stipule of monocot which extends beyond a sheafing leaf-base.

LIGULATE: relative to, or bearing, a ligule.

LIMB: expanded flattened part of a structure e.g. the part of a sympetalous corolla which radiates transversely from the tube.

LINE: now obsolete measure for botanical parts equivalent to 1/12th of an inch or approx. 2mm.

LINEAR: long and narow with parallel sides (phyllodes of **Acacia linearis**).

LINEATE: with thin parallel lines as the venation of parallel-veined leaves when veins are fine and several. Also lineolate.

LINKAGE: association of characters in inheritance, brought about by two or more non-allelic genes which tend to be passed as an inseparable unit (linkage group) from generation to generation and are not subject to independent assortment (q.v.). Separation occasionally occurs by **crossing-over** when, through breakage and reunion of homologous chromosomes, exchange of segments (recombination) proceeds.

LIPID: cell constituent, primarily derived from fatty acid, with diverse role in metabolic processes—may be fat, wax or phospholipid (q.v. for each).

LITHOPHYTE: plant developing on a rock surface, as a lichen.

LITTORAL: inhabiting sea bottom (limit of continental shelf) or lake bottom (down to 30ft.) but extended to shore-line (Black She-Oak **Casuarina littoralis** of Coast and Tablelands).

LOAM: soil in which both fine (silt and clay) and coarse (sand) particles are well represented, not necessarily a top soil or dark in colour.

LOBE: rounded segment of a structure, as the free part of a petal and sepal when divided or cleft to about its middle.

LOCULE: cavity or cell within an ovary, anther or fruit, formed as a unit by partitions within the structure. Also loculus.

LOCULICIDAL: see under dehiscence.

LOMENTUM: legume or pod when constricted between the seeds.

LONG- DAY PLANT: see photoperiodism.

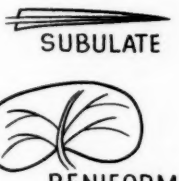
LONGEVITY: length of time a seed may remain dormant and viable (on record are seeds estimated at 1,000 years old successfully germinated).

LORATE: strap-shaped.

LUMEN: cavity of cell with content lost through withdrawal or dessication.

LYCOPSID: fern ally, either a club-moss or quillwort. Club-moss plant with dichotomous stems bearing adventitious roots and simple, scale-like, imbricate leaves within axis of which are borne spore-producing sporangia, frequently the sporophyll leaves in dense terminal clusters to form stroboli, the spores either identical (as in homosporous **Lycopodium**) or dimorphic **(Selaginella)**.

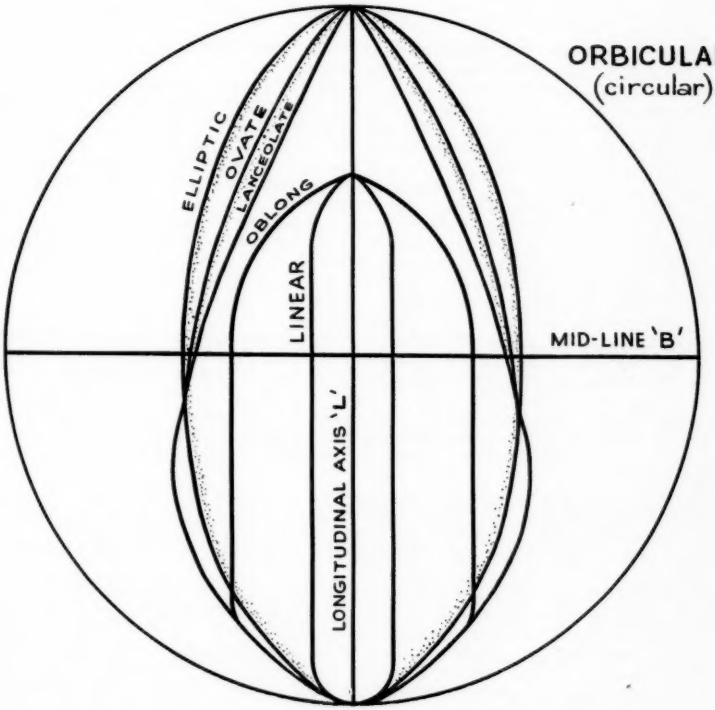
RHOMBIC



SUBULATE

RENIFORM

DELTOID



BASIC LEAF SHAPES according to L x B ratios.

CUNEATE

SPATHULATE

HASTATE

SAGITTATE

Quillwort plant with dense crown of narrow elongate leaves arising directly from inconspicuous, root-producing stem (rhizomorph), sporangia embedded in leaf-bases of two kinds producing microspores and megaspores. Vascular tissue for groups a solid protostele. Germination of spores producing gametophyte either turnip-shaped or thalloid (similar but larger to fern prothallus) as in **lycopodium**, or differentiated to micro- and megagametophyte retained within spore and nutritionally dependent on it (Selaginella and quillwort). **Classification** Class **Lycopsida.** Order **Lycopodiales** (family **Lycopodiaceae** with one genus **Lycopodium)** Order **Selaginellales** (family **Selaginellaceae** with one genus **Selaginella).** Order **Isoetales** (family **Isoetaceae** with one genus, the quillwort **Isoetes).**

LYRATE: with terminal leaflet much larger than other leaflets.

LYSIGINOUS: with cavity in tissue formed by break-down of cells. Cf. schizogenous.

LYSOME: organelle, intermediate in size to mitochondrion and microsome, conceived as site of cell-destructive enzymes.

MACRO-: prefix, large, as in **macroscopic**—visible to unaided eye.

MACULATE: blotched or mottled, as the bark of Spotted Gum **Eucalyptus maculata** and Leopard Tree **Flindersia maculosa.**

MALLEE: habit of eucalypt when shrub-like, with many stems arising above large subterranean lignotuber, in height not reaching above 20 feet. Eucalypts of this habit but not developing lignotuber are **marlocks.** See also under scrub.

MATURATION: process of attaining maturity.

MEDULLA: a central column, as pith of a stem.

MEDULLARY RAY: radiating projection of pith in herbaceous stems, misapplied frequently to vascular ray of woody stems.

MEGA-: equivalent to Macro-.

MEGASPORE: the larger of dimorphic spores.

MEGASPOROPHYLL: see under sporophyll.

MEIOSIS: phase in nuclear behaviour during formation of gametophyte whereby, in two successive divisions of a diploid nucleus, one differs from first mitotic division in failure of chromosome set to duplicate, the effect being that daughter-cells receive each half the genic content of parental nucleus, the homologous chromosomes being distributed equally. Successive divisions in formation of gametes mitotic, hence haploid (or reduced) chromosome content is maintained, the diploid condition being restored in the zygote by the fusion of gametes at fertilization.

MEMBRANOUS: pliable and thin ,transparent and usually not green.

MENDELISM: concept of genetic behaviour in inheritance having as basis to experimental breeding the laws of recombination and segregation (q.v.).

MERI-: prefix, **divided,** as in **meristic**—divided into parts or differing in number of parts.

MERISTEM: region of tissue within which occurs active cell division to form new cells; continuous growth of plant dependent on **indeterminate** meristem localised at tip of roots and stems (apical meristem) responsible for primary growth resulting in elongation (see also intercalary meristem) and **lateral meristem** of vascular and cork cambia responsible for thickening of the axis. Organs with limited growth (leaves, flowers, fruit) are dependent on unlocalised determinate **diffuse meristem** so that cell-division occurs throughout most of the organ, determinate when maturity of organ is reached. Apical meristem may arise also from a callus to regenerate new structure.

MERISTEMATIC: relative to region of meristem or to tissue within which active cell division occurs.

MESO-: prefix, **middle, as in mesocarp**—mid-layer of pericarp.

MESOCOTYL: compound structure formed by a hypocotyl and cotyledon part of many monocot embryos.

MESOPHYLL thin-walled parenchyme of a leaf-blade between the upper and lower epidermis made up of layers of palisade parenchyma and spongy parenchyma. A photosynthetic tissue, the elongated cells of the palisade layer containing the chloroplasts, the spongy layers with fewer chloroplasts have larger intercellular spaces and, through the stomata, are concerned with the gaseous exchange with the atmosphere.

MESOPHYTE: plant growing under average conditions of moisture and in a temperate climate.

METABOLISM: summation of all living processes involving synthesis (anabolism) and break-down (catabolism) of organic matter for the release and utilization of energy.

MICRO-: prefix, **small**, as in **micro-organism**—a microscopic organism, e.g. a bacterium, lower fungus, or unicellular algae.

MICROCLIMATE: the strictly local combinations of atmospheric conditions influencing directly an individual.

MICROPYLE: small pore in outer integument of ovule through which may enter nuclei of a germinated pollen-grain at a fertilization.

MICROSOME: sub-microscopic inclusion of cytoplasm, revealed by electron microscope as a localised point throughout the cytoplasmic reticulum, considered the major site for the synthesis of protein and composed essentially of ribo nucleic acid. (RNA): Also ribosome.

MICROSPORE: the smaller of dimorphic spores.

MICROSPOROPHYLL: see sporophylll.

MIDRIB: a major vein within a leaf continuous with the petiole or node.

MINERAL NUTRIENT. a soil-derived element in ionic form essential for plant growth. On basis of amount required in nutrition classed as major element (nitrogen phosporus, potassium, calcium, magnesium and sulphur) and trace element (iron, manganese, boron, copper, zinc, molybdenum, and chlorine). Many other mineral elements are taken up by the plant which may or may not be of value in nutrition—these include sodium, silicon, aluminium, selenium, iodine, nickel, chromium.

MITOCHONDRION: inclusion of cytoplasm, visible to optical microscope as a rod-shaped, filamentous or spherical structure, probably of RNA constituency with associated enzyme systems, functioning as an activation-site for many of the reactions concerned in respiration.

MITOSIS: the normal nuclear mechanism by which a division to two daughter nuclei, following the splitting of the parent chromosomes to bivalents, results in the equal sharing of the chromosome content so that each daughter nuclei receives a complete set of chromosomes.

MOLD: see fungus. Also mould.

MONILIFORM: constricted at intervals along its length.

MONO- or MONO-: prefixes, **one** or **single** as in **monandrous**—with one only stamen.

MONOCHASIUM: dichasium which has lost by reduction its lateral flowers and appears as a single flower in each inflorescence.

MONOCHLAMYDEOUS: with a perianth of a single whorl, i.e. without petals or with petal-like sepals.

MONOCOTYLEDON: member of angiosperms with most of the following characters: a single cotyledon within the embryo, parallel venation, stele with scattered vascular bundles, predominance of thickened basal stems (as rhizomes, corms ,bulbs) and linear leaves, trimerous floral whorls with series of like nature, shortened internodes, an adventitious (fibrous) root system, cotyledons remaining underground and serving for food-storage. The monocots make up a sub-class **Monocotyledoneae** of **Angiospermae**, conceived by Hutchinson (1959) as of 70 families forming 28 orders.

MONOECIOUS: with unisexual flowers of both sexes appearing on the one plant. Also diclinous. Cf. dioecious.

MONOHYBRID: hybrid differing from parents in a single character.

MONOGENERIC: of a single genus constituting a family.

MONOPHYLETIC: derived from a single ancestral line.

MONOPODIUM: a single axis from which arise all lateral branches.

MONOTYPIC: of a single component, e.g. a genus with a single species.

MONOSTICHOUS: arranged in a single row, or on one side of an axis.

MORPHOGENESIS: science of origin of form and development and the mechanisms involved in biological organization.

MORPHOLOGY: science of form and structure of an organism and its parts.

MOSS: see bryophyte.

MUCRO-: short and sharp process to a structure.

MUCRONATE: equipped with a mucro (leaves, Dusky Bush Pea, **Pultenaea polifolia**). when the mucro is not prominent, **mucronulate**. (Leaf- segments of **Dryandra mucronulata**, the Sword Fish Dryandra).

MULTIPLE ALLELES: series of alleles in similar loci cf homologous chromosomes of a genotype.

MULTIPLE CROSS: cross between more than two parental lines of different origin.

MULTIPLE FACTOR: factors or genes within chromosome having an effect on one specific character.

MULTIPLE FRUIT: see under fruit.

MURICATE: roughened by short, sharp prickles (calyx of **Calycotrix muricata).**

MUTATION: discontinuous change in a chromosome with a genetic effect which may be lethal or induce sterility besides producing slight or profound change in constitution of phenotype which may be of value as a survival feature. Changes effected by the mutation may be by (a) multiplication of entire chromosome set (polyploidy), (b) addition or reduction within the set (aneuploidy, a condition which may induce partial sterility and genetic instability), (c) gross structural reconstitution (which may activate the isolating mechanism leading to speciation), (d) chemical alteration of the chromosomal material.

MYCO-: prefix, **relative to fungus. Mycetoid**—fungus-like.

MYCORRHIZA: root modification through agency of soil-inhabiting fungus (basidiomycete or phycomycete) either forming dense mantle of mycelium over root surface with some hyphae forcing between cortex and epidermis **(ectotrophic)** or forcing some hyphae through to parenchyma **(endotrophic).** Relationship of benefit to both host and partial parasite, providing a nutrient exchange system which, under certain conditions, is essential for some plant establishment.

MYCOTROPHIC: living symbiotically with fungus.

MYRMECOPHILOUS: pollination through agency of ants.

NASTIC MOVEMENT: see under tropism.

NATURAL SELECTION: concept of genetic mechanism supplementary to mutation in evolutionary development, operating on the vast number of randomly-acting gene combinations possible in successive generations, eliminating all but favorable to an environmental adaptation. Effect of selection conceived as restoration of order which mutation tends to disrupt.

NECTARY: gland, mainly of floral parts of entomophilous plants, secreting sugary substance (nectar) of concern in pollination.

NEODARWINISM: concept of evolution as resultant of both mutation and selection as complementary processes.

NERVE, NERVATION: see venation.

NEST LEAVES: sterile fronds forming bracket-like, debris-collecting, structures serving for protection of rhizome and roots of the large bracket epiphytic ferns of **Platycerium.**

NEUTER: with no part functionally fertile, as of sterile flowers.

NICHE: place of organism in microenvironment.

NITROGEN FIXATION: conversion of free nitrogen of air into organic nitrogen compounds. Process involves (1) utilization of free nitrogen by soil bacteria (as the aerobe **Azobacter** and anaerobe **Chlostridium),** the nitrogen compound synthesised becoming available to plant after death and decomposition of micro-organism (2) symbiotic relationship between species of bacterium **Rhizobium** and roots of leguminous plants, **or** (3) action of lightning within atmosphere whereby free nitrogen is oxidised in soil to nitrous oxides.

NITRIFICATION: conversion of organic nitrogen compounds of soil to inorganic nitrogen (as ammonium salts or as nitrates) available to plants by the cumulative action of a succession of soil micro-organisms.

NODE: region of stem from which arise leaf and root systems.

NODOSE: knobby or knotty, as habit of **Melaleuca nodosa.**

NODULE: swelling on root of leguminous plant undergoing symbiosis with nitrogen-fixing bacterium **Rhizobium,** caused by penetration of hyphae and proliferation of invaded tissue.

NOMENCLATURE: standardisation of names referring individuals to groups of related members (taxons) according to a binominial system. System has basis in derivation of a qualifying name to a more general designation, thus applying a binary combination to denote a population including a particular individual The qualifying name is the epithet and this in combination with generic name forms a binomial indicating a species. A second epithet may be used to form a ternary combination denoting that taxon is of lower order than species, i.e. is a variety of the species. As a distinction from names denoting plant members of horticultural origin, which ideally should carry a common-language epithet, names alluding to specific taxa carry latinised epithets together with the name of the author (in abbreviated form)—a taxon name then is a combination of a generic name, an epithet and an indication of the author's name, e.g. the taxon for the Lemon Scented Gum is **Eucalyptus citriodora** Hook. (Hook. being the standard abbreviation of the author Sir W. J. Hooker). Often an annoying feature by the displacement of taxa well-known, their conformation to universal standardisation is dependent on accepted rules which did not apply

when the taxa were first created.

NUCELLUS: region of sporogenous tissue within an ovule extending from chalaza to micropyle.

NUCLEIC ACID: highly complex cell constituent with high molecular weight, formed from pentoses, phosphoric acid and nitrogen bases. Can combine with the protein histones and protamines to form a nucleoprotein, of particular note DNA (deoxyribo nucleic acid) which with its associated protein constitutes the gene unit of a chromosome, and RNA (ribonucleic acid) which with its associated protein is considered the functional force of a microsome, these nucleoproteins seem endowed with reproductability and genetic continuity. Concept of nucleic acid behaviour is that RNA transfers a specific enzyme to the major protein-synthesis site, the microsome, which activates an amino acid forming the basic protein structure, the specification or the order of the specific enzyme being directed by the DNA of the gene. RNA has been located in both nucleus (in nucleoli) and cytoplasm hence may be synthesised in nucleoli and translocated to cytoplasm.

NUCLEUS: highly organised, self-regulating organelle bounded from cytoplasm by a double nuclear membrane and made up of a clear nuclear sap within which is a chromatin network of DNA (see above) and granular bodies, nucleoli, considered to play major part in protein synthesis through its constituent RNA. At a nuclear division, DNA resolves into chromosomes which are conceived as long double-spiralled chains of DNA molecules, each molecule arranged as a linear aggregate of four basic particles or nucleotides (equivalent to genes), the order of the nucleotide in the chain providing the genetic pattern. At nuclear division and consequent break-down of nuclear membranes, the nucleotides are free to move in the cytoplasm. See also endoplasmic reticulum.

NUT: indehiscent, 1-loculed, 1-seeded fruit with a hard-textured outer wall, as that of the Macadamia.

NUTRITION: supply and utilisation of raw materials in solute form (as nutrients) required for synthesis to the higher compounds on which metabolic processes manifesting growth and development are dependent and which provide the source of energy essential to, and inseperable from, metabolism. See also mineral nutrient.

OB-: prefix, **inverted** as in **obconical**—shaped like an inverted cone; **oblanceolate**—lance-shaped but broadest above the middle as a leaf of **Telopea** spp.

OBLIQUE: slanting, or unequal sided, as a leaf with base slant-wise to its petiole (leaf of Broad-leaved Messmate **Eucalyptus obliqua).**

OBSOLETE: rudimentary, or not distinct.

OBTUSE: blunt or rounded as a leaf with an apex not acute. (Obtuse-leaved Grevillea. **G. obtusifolia).**

OLIGO-: prefix, **few,** as in **oligotrophic**—referring to waters or soils with below-optimum nutrient concentration for plant growth.

ONTOGENY: developmental cycle of an organism or organ.

OPERCULUM: a cap or lid to an organ shedding by circumscissile dehiscence.

OPERCULATE: possessing an operculum, as the bud of a eucalypt.

OPPOSITE: on opposing sides of an axis, as leaves on opposing sides of a node.

ORBICULATE: circular in outline (juvenile leaves of **Eucalyptus amplifolia,** Cabbage Gum). Also orbicular.

ORDER: group of related families, or a single family, subordinate to a class, conventionally ending in **-ales** as in **Proteales, Myrtales** etc.

ORGAN: unit of an organism with function specific to nature of tissues which compose it. The primary organs of a plant are root, stem, leaf, a flower is a secondary organ and the fruit a development from the floral organ.

ORGANELLE: general term for a cell inclusion, in particular one which operates as a more or less autonomous system with a specific function and is limited within the protoplast by a complex membrane barrier. Included are nucleus, nucleolus, microsome, mitochondrion chloropast.

ORGANIC ACID: (plant acid) derivative of pyruvic acid formed as an intermediary in oxidative respiration, widely dispersed in plant tissues and fruit and with varying metabolic functions (citric acid, succinic acid, oxaloacetic acid, malic acid, fumaric acid, ketoglutonic acid et al).

ORGANIC EVOLUTION: gradual development of organisms and their populations through a succession of generations, influenced by, and a resultant of, the interacting forces of hereditary and environment.

ORGANISM: the individual or phenotype, a biologically organised, self-regulating, self-duplicating mass of protoplasm with an initial function of generating and utilizing energy for its own complexity.

ORNITHOPHILY: pollination through the agency of birds.

OSMOSIS: diffusion of water through a membrane selectively permeable to water. See also plasmolysis, permeable membrane ,turgor.

OSMOTIC CONCENTRATION: concentration of an osmotically active solute within a solution.

OSMOTIC PRESSURE: maximum pressure which can be developed within a solution when separated from pure water by a rigid membrane selectively permeable to water (i.e. the osmotic concentration of a solution) differing from the turgor pressure (q.v.) in that the latter is the actual pressure developed at an osmosis.

OVARY: the basal, ovule-bearing part of a carpel which may be compound when two or more carpels are united, the divisions then being termed locules.

OVATE: broadest below mid-line and with rounded apex, e.g. leaves of Turpentine **Syncarpia glomulifera: obovate**—reversed ovate, as leaves of Pepperberry Tree **Cryptocarya obovata.**

OVOID: hemispherical below mid-line and elliptical above (fruit of Featherwood **Polyosma cunninghamii).**

OVULE: structure bearing megaspores, the site of egg-cell formation and finally the site of embryo development. Sporogenous tissue is localised in a **nucellus,** its tip exposed by a **micropyle,** the major part enclosed and united with one or two **integuments.** In gymno-sperms borne directly on surface of specialised scale-leaf of cone (strobilus) but in angiosperms formed from (probably as an emergence) and retained by carpel within ovary, attached directly to carpel wall or supported on a basal stalk **(funicle)** and from base **(chalaza)** merge funicle, integument/s and nucellus. Vascular system characteristic of angiosperm ovule but is absent in conifers.

OXIDATION-REDUCTION: loss or gain of electrons by atoms of substances (electrolytes) ionizing in solution, oxidation by loss of electrons, reduction by gain of electrons. The substance (i.e. its elements) losing electrons (being oxidised) is the reducing agent since it is responsible for the reduction (or gain in electrons) of another substance. Conversely, the substance gaining electrons (being reduced) is the oxidising agent. The terms oxidant and reductant may be used, the oxidant being the reducing agent, the reductant the oxidising agent. By illustration of principle, process of photosynthesis may be taken in simplest sense as a reduction—oxidation system (redox system), carbon dioxide being reduced by the gain of hydrogen ions from a hydrogen carrier to form a carbohydrate of form CH_2O, and water by loss of hydrogen ions is oxidised to molecular or free oxygen.

$$CO_2 + 2H_2O \xrightarrow{\text{light energy}} [CH_2O] + O_2 + H_2O$$

In respiration there is an oxidation of a hexose sugar by a loss of hydrogen ions to form carbon dioxide and water with the release of energy:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$$

P_1: see under F_1

PALAEOBOTANY: study of history of evolutionary development of plants by the interpretation of fossil record.

PALMATE: arranged like blades of a fan as leaflets spreading fan-wise from a petiole. e.g. leaves of Cabbage-tree Palm **Livistona australis,** the coppice compound leaf of Queensland Bottle Tree **Brachychiton rupestre.** See also under venation.

PALUDOSE: growing in marshes, as the Swamp She-Oak **Casuarina paludosa.**

PALYNOLOGY: study of spores and pollen grains.

PANICLE: branched raceme of pedicellate flowers, frequently large and loose as in Flame Tree **Brachychiton acerifolium,** Red Cedar **Toona australis** etc. and a frequent inflorescence of the grasses.

PANICULATE: arranged in panicles.

PAPAIN: see under latex.

PAPILIONACEOUS: characteristic of corolla of **Papilionaceae** member when petals modified to a superior standard, two lateral wings and a lowermost connated pair forming a keel. Literally butterfly-like.

PAPILLATE: with minute rounded protuberances (papillae) on surface.

PARAPHYSE: sterile ,hair-like structure found within antheridia and archegonia of mosses and in sporangia of many ferns, frequently of shape characteristic to species.

PARTED: cut or cleft almost to base.

PAPPUS: the bristle, scale, barb, hair or plume frequently crowning the achene of a **Compositae** member, representing the calyx-limb.

PARASITE, PARTHENOCARPY, PLACENTATION, see page 57.

PARENCHYMA: tissue of thin-walled, polyhedral actively-functioning cells, the fundamental or ground tissue of the plant body concerned in all phases of metabolism.

PARTHENOGENESIS: phase of apomixis (q.v.) in which the egg-cell of a diploid gametophyte (q.v.) divides, either without fertilization (autonomous parthenogenesis) or with pollination and partial fertilization (fusion of nuclei to form endosperm) producing an embryo. Plants so formed are maternal in genetic constitution.

PECTIC SUBSTANCE: derivative of pectic acid found in the plant as pectin, dispersed in cytoplasm, and as cell wall constituents, protopectin, calcium and magnesium pectate.

PECTINATE: resembling the teeth of a comb, i.e. of regularly-spaced narrow segments as labellum of King Spider Orchid **Caladenia pectinata.**

PEDICEL: stalk of an individual flower: **pedicellate**—possessing a pedicel.

PEDUNCLE: stalk of a flower cluster, or an individual flower when that flower is the sole member of the inflorescence.

PELLUCID: clear or transparent.

PELORY :floral abnormality, common in the **Labiatae** family, by which bilabiate corollas become radially symmetrical. Also peloria.

PELTATE: with petiole inserted on underside of leaf some distance from the margin, as in **Macaranga tanarius** and the juvenile leaves of **Eucalyptus calophylla, E. citriodora and E. maculata.**

PENNI-NERVED or VEINED: see under venation.

PENTA-: prefix, five, as in **pentamerous**—in whorls of 5, or of 5 parts.

PENTOSE: see sugar.

PEPTIDE: protein with its amino acids linked by a bond, the peptide bond, whereby the amino (NH_2) group of one is linked to the carboxyl (COOH) group of another amino acid forming, with the elimination of water, the bond (-NH-CO-). Structure of the bond typical of proteins and when number of linked amino acids is large (the normal condition of plant proteins), proteins are polypeptides.

PERENNATION: vegetative survival from year to year. In frequently used scheme of Raunkiaer (1903) classing "Biological types with reference to the adaptation of plants to survive the unfavourable season" following recognised on basis of surviving bud: **Phanerophyte**—buds borne on negatively geotropic shoots which project into the air—trees and shrubs; **Chamaephytes**—buds borne on shoots very close to ground—low shrubs; **Hemicryptophytes**—buds borne at soil surface; **Cryptophytes** (or **Geophytes**)—buds buried in soil at distance from surface varying with species; **Annuals** or **Therophytes**—with embryonic bud protected by a seed-coat.

PERENNIAL: of 3 or more year's growth duration.

PERFOLIATE: with growth of leaf-blade continued around stem. Compare with connate. Leaf-form of Digger's Speedwell. **Veronica perfoliata** and the Pondweed **Potamogeton perfoliatus.**

PERI-: prefix, **around**, as in **peripheral**—around or near the circumference.

PERIANTH: collective term for the calyx and corolla of a flower, applied particularly when the floral elements are not distinctly different as in **Telopea** spp.

PERICARP: matured wall of ovary which surrounds and encloses a seed.

PERICYCLE: narrow cylinder of primary tissue (parenchyma) ensheafing the vascular tissues and limited by the endodermis, functioning for storage. Feature of pteridophytes and roots of seed-plants.

PERIDERM: outermost protective layer of tissue replacing epidermis during the secondary growth of older stems and roots of woody plants. Tissue differentiated from meristem of a cork cambium or phellogen and usually is of two layers, the outermost **phellum** of cork or lignin or both and an inner layer of **phelloderm.** See also bark.

PERIGYNY: condition of a floral receptacle when forming a tube around, but not adnate with, the carpel wall (as in epigyny). A flower of this condition is **perigynous.**

PERISPERM: nutritive tissue accessory to endosperm.

PERSISTENT: retaining position for some time after development as leaves, barks and floral parts not deciduous or caducous.

PERMEABLE MEMBRANE: **Appl.** sub-microscopic layer with selective permeability, probably of phospholipid constitution, differentiating cell inclusions as separate, interdependent units within protoplast, e.g., the vacuolar membrane holding as a unit the contents of the vacuole (q.v.) and the outer plasma mem-

brane separating cytoplasm from cell wall provide the principal barriers to passage of solutes within a cell and from cell to cell.

PERMEABILITY: degree to which molecular form of a substance may pass or diffuse through a specific membrane.

PETAL: unit of a corolla, typically laminar, considered a sterile stamen.

PETALOID: resembling a petal, as a petal-like sepal.

PETIOLE: structure attaching leaf to a node, formed by division of meristem at the base of the leaf.

PETIOLULE: individual stalk of a leaflet.

pH: see acidity, alkalinity.

PHELLODERM, PHELLOGEN, PHELLUM: see periderm.

PHENOLOGY: part of ecology concerned with correlation of climatic factors with the vegetative and reproductive development of a plant.

PHENOTYPE: the visible character of an individual, representing the adaptive response of a particular genetic system (i.e. a genotype). Two or more individuals of the the same genotype may appear in different environments as distinct phenotypes, the reverse also is true.

PHLOEM: continuous system of vascular tissue concerned with the translocation of synthesised materials from the leaf, structurally of sieve tubes, the supporting and protective fibres and sclereids, and parenchyma cells functioning for storage and the initiation of the periderm. See also Companion Cell.

PHOSPHATE: (a) inorganic—salt of the mineral element phosphorus, an essential agent of oxidative respiration (b) organic—chemical combination of a simple sugar with phosphoric acid as the first stage in the utilization of sugars in metabolic processes. See also phosphorylation (including energy-rich phosphate).

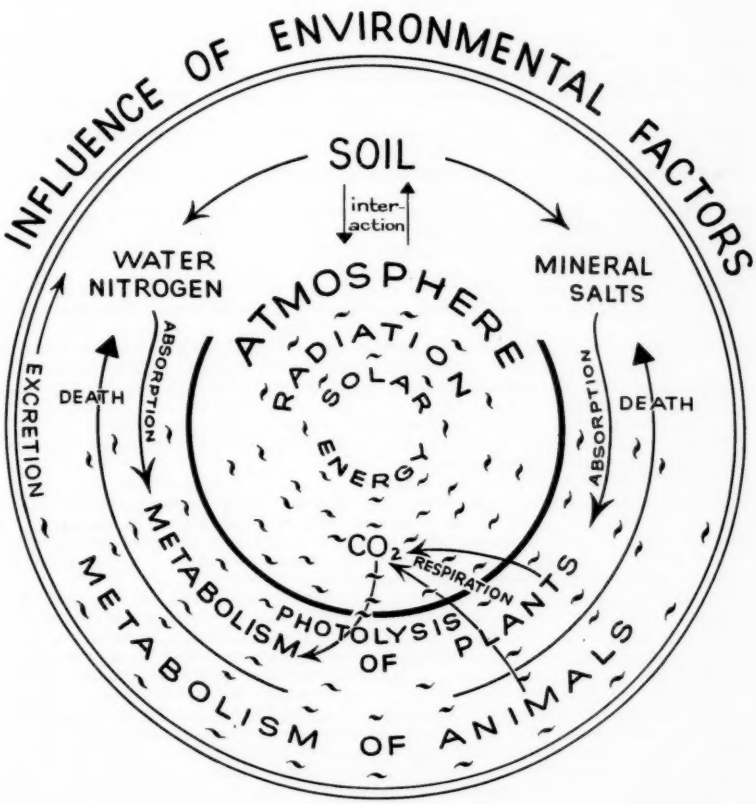
PHOSPHOLIPID: complex constituent of cytoplasm (where appears concerned with structure of membranes acting as diffusion barriers) and chloroplasts, made up of organically-bound phosphates besides fatty acids and other components. Major phospholipids of plant tissue are derivates of glycerol and include phosphatidic acid (found in structural framework of leaves) and, as constituents of seedlings and seeds, lecithin and cephalin.

PHOSPHORYLATION: enzymatic combination of the simple sugars with phosphoric acid. Two phosphorylated compounds of the sugar ribose are carriers of the energy derived from oxidative respiration and photosynthesis—ADP (adenosine diphosphate), the precursor of ATP (adenosine triphosphate)—phosphates derived from ADP and ATP on hydrolysis with acid or enzyme liberate relatively large amounts of energy and are known as **energy-rich** phosphates.

PHOTOPERIODISM: response of plants to length of daily exposure to light (the photoperiod). Each plant is influenced by combinations of the prevailing temperature (for most an optimum range 28-32°C.) and its physiological age but on the basis of the photoperiodic stimulation of flower production the following distinctions are made. **Long-day plant**—flowering only when the daily period of light exceeds a critical duration which varies with the species (summer-flowering plants); **Short-day plant**— flowering under relatively short periods of daily light and longer dark periods (winter or early-spring flowering plants); **Day-neutral plants**—photoperiod not critical to flowering. The induction of flowering by manipulating the photoperiod is **photoperiodic induction;** when temperature is related to photoperiod, **photothermal induction.**

PHOTOSYNTHESIS: process, unique to chlorophyll-bearing plants, converting the radiant energy of sunlight to chemical energy and transforming atmospheric carbon dioxide to a simple sugar: free oxygen released by process then available for the oxidative phase of respiration (q.v.). The pathway of photosynthesis is complex and with several reactions of partly known nature but briefly main stages concern (a) photolysis of water—cleavage of water and its reconstitution with release of oxygen by photoactivated chlorophyll or accessory pigment (as phycoerythrin and phycocyanin of some red algae); (b) photophosphorylation—utilization of energy released by photolysis for synthesis of energy-rich ATP from precursor ADP and inorganic phosphate (c) carbon dioxide fixation—with chemical energy from ATP, reduction of carbon dioxide through complex series of reactions to a 6-carbon sugar by combination of hydrogen cleaved in photolysis with suitable acceptor (a reduced pyridine nucleotide) through an intermediary phosphate ester of a 3-carbon sugar phosphoglyceraldehyde as the first stable product formed. The sugar derived from CO_2 xation (the process proceeding in absence of light) may be converted by oxidation to an organic acid, by reduction to a fatty acid and by oxidation and ammonia uptake to an amino acid. See also phosphorylation,

PREREQUISITE OF LIFE-ENERGY



SOLAR ENERGY AVAILABLE ONLY THROUGH PHOTOSYNTHESIS BY GREEN PLANTS

Green plants convert about 33 calories/cm^2 per year, equivalent to 1/2000th. total available solar energy. Associated with annual conversion to sugar of about 200 billion tons of atmospheric carbon dioxide.

oxidation-reduction.

PHOTOTROPISM: growth response to light, either **positive** when vegetative parts bend or reach towards light, or **negative** when turning away from light (as roots)—shown to be concerned with the differential distribution of auxin.

PHYLLO—: prefix relative to **leaf** as in **phyllophorous**—bearing or producing leaves.

-PHYLLOUS: suffix relative to **leaf** as in **epiphyllous**—borne on a leaf.

PHYLLOCLADE: see cladode.

PHYLLODE: flattened, leaf-like petiole which functions as a leaf (common to **Acacia**). Also phyllodium.

PHYLLODY: abnormal growth of flowers to vegetative shoots, or of petals and sepals to leaf-like structures.

PHYLLOTAXY: leaf and flower arrangement on a stem.

PHYLOGENY: evolutionary development of a population, organism, organ or tissue.

PHYSIOLOGY: science of function involved in processes of growth and development.

-PHYTE: suffix, **plant**, as in **mesophyte**—a plant of temperate conditions. See also under habit.

PHYTO-: prefix, **plant**, as in **phytology**—science of plants, i.e. botany.

PHYTOGEOGRAPHY: study of geographic implication involved in response of plant populations to their environments and the causes of their evolution, perpetuation and migration.

PIGMENT: see anthocyanin, carotenoid.

PILOSE: with slender and long soft hair, as the Cut-leaf Crane's-bill, **Geranium pilosum.**

PINNA-: prefix, relative to incisions of a feather as in **pinnatifid**—of a leaf incised not more than half way to a mid-rib; pinnatipartite—incised slightly more than half way to mid-rib; **pinnatisect**—incised almost or to mid-rib (as in Silky Oak **Grevillea robusta).**

PINNA: (plural pinnae) primary division or leaflet of a pinnate leaf.

PINNATE: with leaflets arranged on both sides of a rachis in featherlike fashion: the leaf-form of **Boronia pinnata.**

PINNATELY-VEINED: see under venation.

PINNULE: leaflet of smallest order in a doubly-pinnate (bipinnate) leaf as in many wattles, e.g. Black Wattle **Acacia decurrens**, Green Wattle **A. mearnsii.**

PISTIL: unit of a gynoecium, either a single carpel when carpels are distinct or a group of carpels when the carpels are fused. **Pistillate**—of a flower with fertile parts represented by carpels only.

PIT: modification in thickening of cell wall where small area left thin and uncovered so that a cavity (pit cavity) is formed. Pits of adjacent cells normally coincide in position to form pit-pair so that each pit-pair has two cavities and a single membrane (closing membrane) formed by fusion of each primary wall of adjacent cells on either side of an intercellular middle lamella. Secondary thickening of wall around pit-cavity may over-arch cavity to form **bordered pit**, a feature of a tracheid, or the pit may remain simple. Pit-pairs function as intercellular diffusion areas and are associated with plasmodesmata (q.v.).

PITH: continuous cylinder at centre of plant axis made up mainly of parenchymatous tissue of both living and dead cells with a function of starch and other material storage. Not a feature of roots, pith of matured trees is referred to as **heart.**

PLACENTA: site of attachment of ovules to carpel wall.

PLACENTATION: arrangement of ovules on carpel wall.

PLANT ACID: see organic acid.

PLASMODESMATA: cytoplasmic strands passing through pores in walls of living cells providing protoplast-connecting system to maintain continuous nature of protoplasm.

PLASMOLYSIS: loss of tension of a cell wall (loss of turgor pressure) and contraction of the cytoplasm from the wall, from water being forced from a vacuole by the osmotic system when the cell is in an environment lower in water content than the vacuole (i.e. the environment [or adjacent cell] is hypertonic to the plasmolysised cell). The reverse **deplasmolysis** is possible when there is an external environment (or cell) with a solute concentration lower than the plasmolysised cell—the reciprocation is a regular event in tissues subject to perpetual water deficits.

PLASTID: self-duplicating cell inclusion various in shape, form and function, concerned with storage, control of diffusion rates and various metabolic

processes. According to nature of pigment contained, generally either a colourless **leucoplast** (starch) or coloured **chromoplast** (carotenoid) of which the chloroplast is a special member.

PLEIO: prefix **more than** as in **pleiocotyl**—possession of more than two cotyledons in an embryo.

PLEIOTAXIS: multiplication in number of whorls, as the doubling effect in number of floral parts in double-flowers.

PLEIOTROPIC: influencing more than one character, as a gene carrying a factor for more than one character.

PLICATE: folded or plaited longitudinally, in the manner of a closed fan (leaves, Cabbage Palms, **Livistona australis**).

PLUMOSE: feather-like, as the sepals of **Verticordia plumosa** or the persistent style of a **Clematis** achene providing for dissemination by wind.

PLUMULE: leaf-bud of an embryo at base of epicotyl.

PNEUMATOPHORE: specialised root which projects above a poorly aerated rooting medium (e.g. mud) and through its constituent aerenchyma tissue is capable or gaseous exchange with the atmosphere. A feature of many hydrophytes as the mangroves **Avicennia marina** and **Bruguiera gymnorrhiza.**

POD: general term for a dry, dehiscent fruit.

POLARITY: differential orientation of parts manifesting organic form

POLLEN: collective term for pollen grains (microspores). See under spore.

POLLINATION: dissemination of pollen and reception of a pollen grain by a stigma. Following reception by a stigma, the pollen-grain develops a tube through which pass most of the grain's content, its wall forming an enclosure for the male gametophyte. The pollen-tube of angiosperms and some conifers extends to the embryo sac where it may penetrate the tissue through either chalaza or micropyle to discharge its nuclei.

While self-pollination is common in nature, cross-pollination is more general, the chief disseminating agents being wind **(anemophily)**, insect **(entomophily)**, water (hyrophily) and bird (ornithophily).

POLLINIA: (singular pollinium) waxy aggregate of pollen with value in entomophily, commonly formed by members of the milkweed family **Asclepiadaceae**, and the **Orchidaceae.**

POLY-: prefix, **many**, as in **polydelphous**— with stamens grouped into 3 or more bundles by the connation of filaments.

POLYANDRY: production of an indefinitely large number of stamens within an androecium.

POLYEMBRYONY: formation of embryos at an apomixis (q.v.) directly from the tissues of nucellus or integument of ovule. Of frequent occurrence in the mango **Mangifera indica.**

POLYGAMODIOEIOUS: functionally dioecious but with some flowers of opposite sex or some bisexual flowers within the inflorescences **(Brachychiton** et al).

POLYGAMOUS: bearing both unisexual and bisexual flowers within the inflorescences

POLYGENIC: involving th segregation of several genetic factors in variation.

POLYMORPHISM: differentiation (variation) within a population of a particular habitat as a phase of the process of selection, the variant/s appearing as genetic mutants in temporary or permanent balance and in frequencies according to the survival value of the reconstituted genetic system/s. See also cline, heterosis.

POLYPETALOUS: with petals appearing as distinct units of a corolla.

POLYPLOIDY: mulplication of number of chromosome sets normal to the haploid, the primary effect being the increase in volume of the nucleus manifested in the **polyploid** by differences in size, resistance and fertility. Frequent for plants in nature and a means by which prodgeny of interspecific hybridizations may become fertile (see amphiploid), may be induced by such chemicals as the alkaloid colchicine when applied to plant or seed, the effect of the treatment being that mitosis is checked after chromosome division but before the new nuclear membrane is formed. **Somatic polyploidy** or **polysomatry** refers to **polyploidy** of certain cells within a normal **diploid plant.**

POLYSEPALOUS: with sepals of a calyx appearing as distinct units.

POME: fleshy, multi-loculed and seeded fruit formed from an ovary fused with a floral cup, the fleshy tissues representing the enlarged floral cup. An accessory fruit, appears confined to a section of the **Rosaceae**, many of the members being well-known in cultivation, e.g., **Photinia**, the Loquat **Eriobotrya japonica**, India-Hawthorn **Rhaphiolepis indica**, Flowering Quince **Chaenomeles** spp., Quince **Cydonia oblonga**, Pear **Pyrus** spp., Apple **Malus** spp.

POPULATION: group of individuals among which there is free inter-breeding

and gene exchange.

POSTERIOR: converse of anterior, i.e. of the side facing the axis to which the part is related.

PRECIPITATION, EFFECTIVE: measure of rainfall as a source of soil moisture for plants.

PRICKLE: a weak, spine-like structure developed from outermost tissues; a second rank appendage of the stem known as an emergence.

PRIMARY TISSUE: fundamental tissue formed by primary growth from apical meristems and primordia, concerned with the build-up of new parts of plant by increase in length of axis and its branching system. By repetitive addition of layers formed by secondary growth, the primary tissue ultimately is engulfed.

PRIMORDIUM: (plural primordia) site of active cell division initiating new growth of parts. Also primordial meristem, promeristem.

PRO-: prefix, **before**, as in **proembryo**—initial stage of embryo before differentiation of cotyledons and axis; **promeristem:** foundation site of new growth from meristem.

PROCUMBENT: trailing or lying flat on the ground but not rooting, as stems of the Trailing Swainson Pea **Swainsonia procumbens.**

PROLIFERATION: abnormal production of parts, e.g. the development of a floral receptacle to a normal leafy shoot, with the disruption of the flower or fruit.

PROLIFEROUS: reproducing by stolons, offsets or adventitious buds.

PROPAGATION: reproduction by vegetative means.

PROPAGULE: bud or shoot capable of development.

PROPHYLL: much-reduced leaf subtending base of a lateral branch, usually forming an opposite or distant pair in dicots, but in monocots occurs singly. The bracteole is a prophyll limited in occurrence to an inflorescence.

PROP-ROOT: adventitious aerial root from stem forming stilt-like support to ground. Also stilt-root. Developed by many mangroves and the Screw Pine **Pandanus pedunculatus.**

PROSTRATE: lying flat on the ground, as stems of **Banksia prostrata.**

PROTANDROUS: with anthers releasing pollen before stigma of same flower becomes receptive to its germination. When the reverse is the case, **protogynous.**

PROTEAD: member of the family **Proteaceae.**

PROTEIN: organic compound with high molecular weight, formed by linkage (peptide bond) of amino acids, a major constituent of enzymes and concerned with all phases of metabolism. In plant tissues frequently combined with sugars to form glycoproteins, with lipids to form lipoproteins, with nucleic acids to form nucleoproteins.

PROTEOLYTIC: protein-splitting, as a protein-specific enzyme (e.g. papain), either a peptidase or protease.

PROTHALLUS :gametophyte of the pteridophytes developed by direct germination of a spore, usually a thalloid structure bearing antheridia and archegonia.

PROTO-: prefix, first-formed, as in **prototype** the **ancestral** form.

PROTOPLASM: dynamic colloidal system, essentially of water (up to 90%), inorganic substances (as mineral salts) and organic enzymes, proteins, lipids, carbohydrates, nucleic acids, pigments, growth substances and vitamins; a reaction vessel with the principal function of generating and utilizing energy for growth, regeneration and reproduction.

PROTOPLAST: unit of protoplasm delimited by a cell wall but continuous with other protoplasts (in multicellular organisms) by cytoplasmic strands passing through the wall. Structurally made up of two major regions, the cytoplasmic matrix and the nucleus, each with its several inclusions.

PROVENTITOUS: arising from an accessory source, as dormant buds of eucalypts capable of continuance in growth (to proventitious or epicormic shoots) when the primary (naked) buds are destroyed.

PRUINOSE: glaucous, as leaves of Frosty Wattle **Acacia pruinosa** and Silver-leaved Box **Eucalyptus pruinosa.**

PSAMMOPHYTE: plant normally growing on sand or gravelly ground.

PSEUDO-BULB: thickened bulbous stem of certain orchids (e.g. **Dendrobium**), usually an internode, formed each growth season, functioning for storage of reserve materials.

PTERIDOPHYTE: member of the fern and fern-ally divisions **Pteridophyta** (ferns), **Spenophyta** (horsetails), **Lycophyta** (club mosses), and **Psilophyta** (genera **Psilotum** and **Tmesipterus**); a spore-bearing vascular plant with the sporophyte the conspicuous generation, differentiated into true roots, stems and leaves. See also fern, lycopsid.

PTEROSPERMOUS: bearing winged seeds **(Casuarina** spp., many **Proteaceae).**
PUBESCENT: covered with a short stiff down, as Downy Wattle **Acacia pubescens.**
PUNCTATE: with translucent dots or depressions, as leaves of many members of **Rutaceae, Myrtaceae, Lamiatae** where dots represent oil-secreting glands.
PUNGENT: terminating in a stiff sharp point, e.g. leaves of Devil's Pins, **Hovea pungens.**
PURE LINE: progeny of a self-fertilized homozyous parent.
PYRIFORM: pear-shaped, as the fruit of Woody Pear **Xylomelum pyriforme.**
PYXIS: capsule dehiscent by transverse circular slit (fruit of Common Purslane **Portulaca oleracea).** Also **pyxidium.**
QUADRI-: prefix, **four,** as in **quadrifid**—cleft into 4 parts.
QUIN- or Quinque: prefix, **five,** as in **quinary**—with 5 parts in a whorl, **quinquepartite**—cleft into 5 parts, **quinquenerved**—with 5 main veins.
RACE: see **form.**
RACEME: simple inflorescence in which the axis elongates for an indefinite period, producing along length stalked flowers.
RACEMOSE: developing acropetally on a floral axis as flowers forming a spike, catkin, raceme, corymb, umbel, head, panicle, thryse.
RACHILLA: a secondary rachis.
RACHIS or RHACHIS: primary axis of an inflorescence or compound leaf.
RADIALLY SYMMETRICAL: capable of division into 2 or more equal parts. Actinomorphic.
RADIATE: spreading from a common centre, as the buds and fruit of Narrow-leaf Peppermint **Eucalyptus radiata** arising from a peduncle.
RADICAL: arising from a root or region close to the root, as basal leaves forming a rosette at the soil surface.
RADICANT: rooting from the stem, as the adventitiously-rooting Marsh Daisy **Brachycome radicans** which also has radical leaves.
RADICLE: the root initial of an embryo.
RAINFOREST: closed plant community dominated by trees forming a two or more layered dense canopy in which lianes and epiphytes are usually conspicuous, and a lower sparse assemblage of smaller trees, shrubs, herbs and ferns. Classed on latitude as tropical, sub-tropical and temperate rainforest.
RAPHE: ridge formed on ovule by adnation with its funicle.
RAPHIDE: needle-like crystal of calcium oxalate occurring in certain vegetative tissues, either singly or in a group (e.g. **Araceae, Vitaceae** members).
RAY: see medullary ray, ray system.
RAY FLORET: unit of **Compositae** inflorescence borne usually as member of outermost single series of florets forming head, its corolla ligulate.
RAY SYSTEM: transverse radiating system of ray parenchyma within secondary xylem and phloem interconnecting with the vertical (axial) vascular system.
RECEPTACLE: tip of a floral stem bearing the floral units forming a flower.
RECESSIVE: the alternative gene for a factor suppressed partially or wholly by the dominant allele. See also dominance.
RECIPROCAL CROSS: reversal of the sex of gametes contributed by the same parents of a initial cross, i.e. the donor of the pollen grain at an initial cross now becomes the recipient.
RECLINATE: turned or bent downwards, as the habit of the heath **Epacris reclinata.**
RECOMBINATION: reconstitution of the genetic pattern at a fertilization of heterozygous individuals as a result of new gene-combinations possible of all factors carried by the heterozygotes but not manifested in the phenotypes: considered main immediate source of variability within populations, progeny receiving the recombined genes appearing as distinct genotypic segregates.
REDOX: see under oxidation-reduction.
REDUCTION DIVISION: see meiosis.
REDUCTION, MORPHOLOGICAL: loss or suppression of parts as result of increased specialization.
REFLEXED: bent or turned abruptly backwards.
REGENERATION: replacement or restoration of lost parts to produce again a complete individual. In higher plants by (a) **reconstitution**—(least common) reorganization of meristematic tissue to reform the original structure, e.g. by formation of root or shoot primordia from the tissue underlying a wounded surface; (b) **restoration**—development or activity within meristematic tissue in adjacent regions, e.g. by formation of meristem within callus of a severed surface or the development of dormant buds to proventitious (epicormic) shoots, to replace the lost part (c) **reproductive regeneration** or **vegetative**

reproduction—natural separation of a part of vegetative body and establishment of part as new individual, e.g. by production of bulbils or adventitious growth from leaves.

RELIC: population now occupying restricted part of area where once abundant. Also relict.

REPENT: lying close to ground and rooting adventitiously, as Kidneyweed **Dichondria repens,** Creeping Monkey-flower **Mimulus repens.**

REPRODUCTION: production of a complete organism, cell or organelle as a duplicate with the physiologic and genetic pattern of its originator. In production of complete organism may be by (a) **asexual reproduction,** including apomixis, vegetative propagation, binary fission (the splitting into two parts, as by bacteria and lower algae), budding (the division of a cell from parent body of a yeast); (b) **asexual reproduction**—requiring meiosis and fertilization for its completion, the product being either a spore (e.g. bryophytes and ferns) or seed (gymnosperms and angiosperms) with capacity to develop to individual; (c) **parthenogenetic reproduction**—entailing partial sexual reproduction.

RESIN: water-insoluble, aromatic hydrocarbon derivative of complex constitution, frequently oxidation product of essential oil, secreted in plant tissue usually in cavities or canals. Resins with slight (or no) essential oil content and hard and brittle, non-volatile and translucent nature are **hard resins** possessing value in industry as sources of varnishes and lacquers et al. Kino (q.v.) represents one type, other types yielded from Australian plants include the acaroid or grass-tree resin from the "black boy" or yacca (the arporescent members of **Xanthorrhoea,** namely **X. tateana** (S.A.) and **X. preissii** (W.A.) as the commercial sources) which store the resin at the abscission site of fallen leaves from the trunk, and **Callitris** resin (Sandarac resin) exuded from the trunk or stump of the white pine **Callitris hugelii.**

RESPIRATION: the energy-releasing oxidation (see also fermentation) of sugars and other synthesised materials through a series of complex reactions to form carbon dioxide and water, with enzyme systems as necessary associates. In photosynthetic plants may be considered as of two phases (1) the **glycolytic** pathway or glycolysis, the aerobic or anaerobic enzymatic phosphorylation of glucose to pyruvic acid and (2) the **TCA** (tricarboxylic acid) or modified **Kreb's cycle,** the aerobic (oxygen derived from photosynthesis) break-down of the pyruvate derivative by enzyme systems sited in mitochondria, with the release of carbon dioxide and energy, the latter stored as chemical energy in the bonding of the energy-rich phosphates. See also oxidation-reduction, phosphorylation.

RETICULATE: forming a net-work, as the venation of Blueberry Ash, **Elaeocarpus reticulatus.**

RETUSE: with a narrow and shallow notch in an obtuse apex (leaf of the Honeysuckle, **Banksia marginata).**

REVOLUTE: with margins or apex rolled backwards, as the leaf-margin of **Dryandria speciosa.**

RHACHIS: see rachis.

RHIZO-: prefix, **root,** as in **rhizomorphous**—root-like, in the nature of a root.

RHIZOID: root-like structure functioning as a root but not with the internal structure of a root; the absorbing system of bryophytes.

RHIZOMATOUS: resembling or developing a rhizome.

RHIZOME: root-like underground stem with nodes, buds or scale-like leaves.

RHIZOMORPH: part of a stem bearing adventitious temporary roots which function for absorption, the normal rooting method of the lower pteridophytes which have no true root system. Also rhizophore.

RHOMBIC: resembling an equilateral parallelogram with acute angles, as leaves of **Pittosporum rhombifolium** and **Bossiaea rhombifolia;** a three-dimensional figure of rhombic shape (more or less diamond-shaped) is **rhomboid** or **rhomboidal.**

RHYTIDOME: see under bark.

RIB: a primary or prominent major vein; when single and prominent, separating a lamina in two parts, a **mid-rib.**

RIPARIAN: of rivers or streams. Applied to river or stream-side flora.

ROOT: the subterranean absorbing, storing and anchoring organ continuous with the stem, frequently branched, with outgrowths, **root hairs,** of the epidermis close to the growth tip which provide the major absorbing surface, and **root cap** at the growth tip constantly replaced by active meristem during its function of protection against abrasion. Tisseus of root form epidermis, cortex

and vascular system,. See also rhizomorph, rhizoid, adventitious root.

ROSETTE: a radiating or circular cluster, as a cluster of radical leaves e.g. of the Plantains, **Plantago** spp.

ROSTRATE: with a small beak-like projection, the rostellum, as that of the style of many orchid flowers.

RUFOUS: reddish-brown, as the rust-coloured hairs on the leaves of the Pencil Cedar **Didymocheton rufum.**

RUGOSE: Wringle, as a fruit of native pomegranate **Capparis mitchellii,** or leaves of Wrinkled-leaf Thomasia, **T. rugosa.**

RUNNER: slender trailing stem which takes root at the nodes.

SAGITTATE: arrow-head shaped, i.e. resembling an isosceles triangle with the basal angles forming lobes pointing downwards or towards the petiole, e.g. the leaves of the cultivated Arrowhead **Sagittaria sagittifolia.**

SALINE SOIL: soil in which the accumulation of salts (e.g. of calcium, sodium, magnsium sulphates) is in sufficient concentration to interfere with the osmotic mechanism of plants other than the halophytes.

SAMARA: dry, usually one-seeded fruit with a thin flat structure (wing) of aid in dissemination by wind. The fruit of Whitewood, **Atalaya hemiglauca.**

SAPONIN: see glycoside.

SAPROPHYTE: normally non-green plant dependent for its nutrition on decayed or decaying vegetable matter, e.g. members of **Thismia,** fleshy herbs with leaves reduced to scales and some orchids.

SAVANNAH: a grassland community with scattered trees (tree savannah) or shrubs (shrub savannah). See also woodland.

SCABROUS: rough to the touch, as the Rough Honey-Myrtle, **Melaleuca scabra.**

SCALARIFORM: ladder-like, as the pit-arrangement of many tracheids and vessels.

SCANDENT: climbing by aerial roots or tendrils, as the Common Apple-berry **Billardiera scandens.**

SCAPE: a flowering stem or peduncle, with leaves replaced by scales or bracts.

SCAPIGEROUS: bearing a cap, as the Ground Orchids **Pterostylis** spp. Also scapose.

SCARIFICATION: breaking, by chemical or mechanical means, water-impermeable seed-coats to permit entrance of water for the stimulation of germination.

SCARIOUS: dry, thin and membranous, usually non-green.

SCHIZO-: prefix, **cleavage,** as in **schizophyte,** a plant reproducing solely by binary fission as a bacterium, or lower algae.

SCHIZOCARP: dry fruit dehiscent in two or more parts, each part a one-seeded mericarp. The fruit of Petalostigma. **P. pubescens.**

SCION: see under graft.

SCIOPHYTE: plant with optimum development in subdued light.

SCLERE- or SCLERO-: prefix, **hard,** as in **sclerophyll**—plant with hard-textured leaves.

SCLEREID: unit of sclerenchyma, a cell with lignified thick walls and usually with contents dessicated, dispersed throughout plant tissue particularly in cortex, xylem, phloem, fruit and seed, present also in epidermis and some leaf mesophylls.

SCLERENCHYMA: supporting and strengthening tissue, mainly of non-living cells of two types, fibers and sclereids,, with low water content and frequently lignified walls.

SCHIZOGENOUS: with cavity formed within tissue by retraction or spatial movement of cells. A combination of cell movement and cell destruction (lysigenous formation) to form a cavity within tissue is described as **schizolysigenous.**

SCLERIFICATION: transformation of parenchyma to sclerenchyma by withdrawal of cell contents and lignification of the walls.

SCLEROPHYLL FOREST: closed plant community dominated by evergreen sclerophyllous trees characterised by flat-topped crowns and trunks equal to or longer than the depth of the crowns.

SCLEROPHYLLOUS: with an abundance of sclerenchyma, as coriceous leaves (e.g. leaves of most eucalypts). See also xeromorph.

SCRUB: community dominated by tall shrubs or small low-branching trees, frequently forming dense thickets e.g. the mulga and brigalow scrubs, the former a prominent community of arid environments, the latter an indication of potential high-fertility soils. When the dominant members of a scrub are shrubby multi-stemmed eucalypts, the community is termed a mallee.

SCUTELLUM: shield-shaped part of cotyledon of many monocots, specialised for storage of nutrient in the seed outside the embryo.

SECONDARY TISSUE: tissue formed by secondary growth from cambia con-

cerned with the repetition of layers of primary tissue to increase bulk of plant and to provide new conducting cells and additional protection and support.

SECRETORY CELL: cell concerned with storage of byproduct of metabolism (as latex, gums, resins, essential oils) occurring either singly (e.g. at the tips of hairs, or within tissue) or aggregated to form a group (e.g. a laticiter). By disruption of spatial movement (or both) of cells within a tissue, a cavity or gland serving for storage of specific secretions may be formed (e.g. an oil gland).

SECUND: arranged on one side, as the unilateral arrangement of leaves (e.g. pinnae of **Macrozamia secunda**) or flowers (e.g. members of **Calothamnus**) on a stem.

SEED: matured ovule and its integuments (forming the seed coat) within which develops an embryo resultant from a zygote formed at fertilization. Concurrent with zygote formation, a second fertilization produces a nutritive endosperm which may or may not be present in mature seed; occasionally present an accessory perisperm representing remains of nucellus. Seed of most angiosperms enclosed by enlarged carpel forming fruit which by dehiscence or disintegration may release seed. See also parthenogenesis, apogamety.

SEGREGATION: separation of alternative factors (alleles) to different gametes from a hybrid or heterozygote, each gamete carrying unchanged one or other of the alternatives.

SELECTION: concept of a genetic mechanism in evolutionary development supplementary to mutation, operating on the vast number of randomly-acting gene combinations possible in sucessive generations, eliminating all but the favourable to an environmental adaptation. Effect of selection on mutation conceived as a restoration of order which mutation tends to disrupt.

SELF: progeny of a self-fertilization.

SELF STERILITY: incompatibility of gametes formed within self-pollinating flower.

SENESCENCE: physiological ageing or advancing maturity.

SEPAL: the leaf-rank unit of a calyx.

SEPALOID: resembling a sepal.

SEPTATE: divided by partitions (septa).

SEPTICIDAL: in dehiscence splitting open along lines of septa common to adjacent carpels.

SERAL: relative to a sere or succession.

SERE: succession (q.v.) or stage in a succession. A sere on rock is a **lithosere**, on sand a **psammosere** and in an arid area a **xerosere.** A sere arising from a disturbed habitat is a **subsere,** in a completely changed habitat a **prisere.**

SERICEOUS: with the texture of silk (hairs on pedicels of Silky Hakea, **H. sericea).**

SERRATE: with margins saw-toothed with teeth pointing forwards (leaves of the Red Honeysuckle **Banksia serrata** and Callicoma **C. serratifolia**).

SERRULATE: minutely serrate (leaves of Native Rose, **Boronia serrulata).**

SESSILE: without a supporting stalk.

SETA: a bristle.

SETACEOUS: shaped like a bristle (awn of Corkscrew Grass, **Stipa setacea).**

SETOSE: bearing a bristle or bristles as the spikelet of the grass **Dichanthium setosum.**

SEROLOGY: a bichemical method of establishing plant affinity by the type of antibody produced by an experimental animal as response to injection of protein extract from plant. Also Serio-diagnosis.

SEXUAL REPRODUCTION: see under reproduction.

SHOOT: closely integrated system formed by stem and leaf-units.

SHRUB: woody plant in which apical dominance (q.v.) is replaced at early growth-stage by lateral branching so that no single stem is dominant, in height normally not above 20 feet.

SIEVE ELEMENT: unit of phloem concerned in translocation of synthesised materials from leaves, the cell denucleated when mature and with end-walls perforated by numerous pores, or sieve element encased in carbohydrate callose which may block and defunction cell. Commonly associated with sieve-tube is companion cell, a parenchyma cell with unkonwn but intimate relationship.

SINUATE: with a wavy margin, the indentations marked.

SOIL: the weathered superficial layer of the earth's crust together with the flora and fauna (edaphon) and the products of their decay.

SOLITARY FLOWER: flower borne singly on an axis—considered either a reduction of an inflorescence or the primitive condition from which inflorescences evolved. See also monochasium.

SOMATIC: of the vegetative body or **soma** in contrast to the germplasm of the gamete-forming mother cell.

SORUS: (plural **sori**) cluster of sporangia located on dorsal surface of fern leaves.

SPADIX: spike with fleshy or succulent axis with flowers frequently partly embedded in axis—a character of the **Araceae.**

SPADICIFORM: in the form of a spadix.

SPATHE: bract or leaf, sometimes petaloid, enclosing (at least in bud stage) a spadix.

SPATHACEOUS, SPATHOSE: bearing or resembling a spathe.

SPATHULATE: spoon-shaped, i.e. tapered from a base to an enlarged and rounded apex, e.g. leaves of Spoon-leaf Sundew **Drosera spathulata.** Also spatulate.

SPECIES: basic unit of binomial system of nomenclature, suborbinate to a genus, referrable to systems of populations with phenotypic and genotypic similarities (ecospecies) but not necessarily objectively interpreted in the taxonomic species. The infra-specific categories are **sub-species** or its equivalent **variety** and the unit of least magnitude, **forma** (or form).

SPECIATION: evolution of a species by the segmentation of a previously continuous population into two or more populations which are morphologically discontinuous and reproductively isolated from one another. See also isolation.

SPECIFIC: relative to a species.

SPERM: the male gamete: in ferns and lower gymnosperms ciliate and actively motile but in higher gymnosperms and angiosperms contained as nuclei within a pollen-tube

SPERMATOPHYTE: a seed-bearing plant., a member of the division **Spermatophyta** comprising the angiosperms and gymnosperms.

SPICATE: resembling or arranged in a spike .

SPIKE: unbranched, elongated, indeterminate inflorescence with flowers sessile on the rachis and either close together or scattered. **Callistemon** and **Melaleuca** members frequently with conspicuous spikes.

SPINE: sharp and sclerophyllous outgrowth from leaf or leaf-part, or a modification of an entire leaf. Cf. thorn.

SPINOSE, SPINOUS: provided with spines, as the Blackthorn **Bursaria spinosa.**

SPINESCENT: terminating in a sharp spine or point, as branches of **Leptospermum spinescens.**

SPINULOSE: with small spines, e.g. the leaves of the Honesuckle **Banksia spinulosa.**

SPORADIC: scattered, not forming a continuous population.

SPORANGIUM: unit of a sporophyll within which is developed spore cells. Of angiosperms, the **microsporangium,** a unit of an anther chamber (4 sporangia typically to each anther), and **megasporangium,** a group of sporogenous cells within an ovule.

SPORE: a reproductive cell. Of angiosperms and gymnosperms termed **megaspore** (former by meiotic division of a spore mother-cell within nucellus to a tetrad, 3 cells of the tetrad disintegrating, the survivor to become the embryo-sac mother cell) and **microspore** (formed meiotically from the spore mother-cell within an anther chamber in tetrads, each to become a pollen grain).

SPOROGENOUS: spore-producing.

SPOROGONIUM: see under bryophyte.

SPOROPHYLL: fertile, or sporangium-bearing, leaf or leaf-order part, either a **microsporophyll** (the stamen of angiosperms) when male, and **megasporophyll** (the carpel of angiosperms) when female.

SPOROPHYTE: the spore-producing generation, genetically diploid, represented in vascular plants by the conspicuous vegetative plant. See also Alternation of Generations.

SPORT: the product of a somatic mutation, the phenotypic character so modified that the individual may be continued as a clone but not as a genetically distinct entity.

SPREADING: extending outwardly or transversely.

SPUR: a sac-like or tubular projection from a sepal or petal, frequently secreting a nectar (e.g. of many orchid flowers).

STAMEN: unit of androecium typically comprising a pollen-bearing anther and a supporting filament, arranged on the receptacle in spiral (the primitive condition), whorled or fasciculate order with many modifications.

STAMINATE: with all functional fertile parts of a flower, male.

STAMINODE: (plural staminodia) a floral unit representing a sterile stamen.

STARCH: polysaccharide serving as a major reserve carbohydrate throughout the plant and seed, synthesised in chloroplasts by activation of the starch enzyme phosphorylase on phosphorylated glucose, the reaction being reversible and dependent on the respective amount of substrates. The caudex of the Burrawang **Macrozamia spiralis** particularly rich in starch and, in the past, has provided a limited commercial source.

STELE: the primary arrangement of a vascular system.

STELLATE: star-like, as hairs which have radiating branches.

STEM: the basic axial organ of the plant body which, with its appendages, forms the shoot.

STENO-: prefix, narrow, as in stenophyllous—narrow-leaved as the Leafy Templetonia **T. stenophylla.**

STEPPE: (shrub steppe) shrub-dominant vegetation form in which shrubs are semi-erect and have semi-succulent leaves—in Australia mainly halophytes of which the saltbush **(Atriplex, Rhagodia, Bassia** et al spp.) and bluebush (Kochia spp.) are the dominant members in semi-arid and arid areas.

STERILE: without functional fertile parts.

STEROL: complex triterpene derivative of little-understood nature but universally distributed in plant tissues and extracted for its value as starting material in preparation of synthetic hormones (e.g. sitosterol from many monocot seeds, stigmasterol from soybean seed) and ergosterol from yeast provides source for synthetic vitamin D. Interest in sterols from plants (e.g. from soybean) at present directed to use in synthesis of cortisone. Also steroid.

STIGMA: part of carpel which bears the pollen-receptive stigmatic tissue, frequently continuous with the ovary by a style.

STIPE: stalk formed from carpel and bearing a single carpel as in the flower of members of the **Winteraceae** (e.g. the Native Pepper **Drimys insipida).** Cf. gynophore. Also the petiole of a fern.

STIPEL: a stipule, or stipule segment, at the base of a leaflet.

STIPITATE: borne on a stalk or stipe.

STIPULE: a lateral part of a leaf borne either near or at the base of the leaf, one on each side, or on the stem free from the leaf but originating from the leaf base.

STOLON: a shoot bending to the ground and developing adventitious roots, each section of stem and root on division capable of becoming an individual plant. **Stolonate, stoloniferous**—reproducing by stolons.

STOMA: (plural stomata) a pore-like structure of the leaf-epidermis together with the associated crescent-shaped guard-cells, functioning for the passage of water-vapor from the plant to the atmosphere ,and the gaseous exchange during photosynthetic and respiratory processes. The opening and closing of the pore is controlled by changes in the turgidity of the two guard cells.

STOMATIFEROUS: bearing stomata.

STONE CELL: a sclereid (q.v.).

STRATIFICATION: treatment, by chilling under moist condition, seeds dormant by need to complete certain chemical changes before further development (after-ripening). According to species, conditions vary from -1 to 2° C. for from 1 to several months.

STRATUM: (plural strata) layer in a plant community formed by appearance at the one level of an aggregation of plants of the one habit, e.g. a tree stratum, herbaceous stratum.

STRIATE: with fine longitudinal lines or channels, as venation in which several common-order fine veins emanate from a point at the leaf-base (leaves of the Prickly-leaved Paperbark **Melaleuca styphelioides).**

STRICT: of erect habit, e.g. that of Hop Acacia, **A. stricta,** and the Blue Mountain Mallee **Eucalyptus stricta.**

STRIGOSE: with an indumentum of short, sharp and fine, appressed hairs as leaves of Peach-heath **Lissanthe strigosa.**

STROBILUS: a cone-like reproductive structure characteristic to the gymnosperms, made up of a branch bearing sporophylls. The typical microsporophyll is a spirally-arranged short, flattened petiole continued to a mid-rib with two pollen-sacs arranged parallel and on the dorsal surface. The megasporophyll is a scale bearing (usually) two ovules and subtended by a bract.

STYLE: the sterile part of a carpel connecting a stigma to its ovary.

SUB-: prefix, **almost** or **somewhat** as in **sub-sessile**—almost sessile, i.e. with an inconspicuous petiole or pedicel. **Sub-microscopic**—partly discernible by the highest magnification of the optical microscope, as the structure of organelles.

SUBERIFEROUS: cork-producing.

SUBERIN: a water-impermeable mixture of fatty acid derivatives related to cutin, deposited in the walls of the cork cells of phellum.

SUBERIZATION: the deposition of suberin in cell walls.

SUBEROSE: of cork-like texture.

SUBTEND: to stand below or close under, as a bract below a flower.

SUBSTRATE: material activated (or catalysed) by an enzyme or fermentative micro-organism.

SUBULATE: awl-shaped, tapered gradually from the bass to a sharp point, e.g. leaves of the Bottlebrush **Callistemon subulatus.**

SUCCESSION: the progressive change in the structure of vegetation of a particular area from initial colonisation to ultimate climax.

SUCCULENT: (plant) adapted to drought tolerance by production of an extensive water-absorbing root system close to soil-surface, and modification of aerial parts to fleshy water-holding structures with much reduced transpiring surface, photosynthesis being limited in rate as consequence, hence growth of plant proceeding at low rate. See also xerophyte.

SUCKER: shoot developed from a root or underground stem (e.g. a lignituber).

SUFFRUTESCENT: with lower part of stem immediately above ground level more or less woody and perennial, the character of an herbaceous perennial.

SUGAR: carbohydrate, in plant the basic building block initially derived (as a hexose) from carbon dioxide by photosynthesis, readily translocated either as sucrose or starch. Concerned as substrate for respiration and, in phosphorylated form, in the synthesis of most constituents of the plant. Simple sugars of most concern are 6-carbon hexoses (glucose, fructose, mannose and galactose) and 5-carbon pentoses (xylose, arabinose, ribose, deoxyribose) found as constituents of more complex derivatives (e.g. the polysaccharide xylans and arabans are constituents of both woody tissues and many culms).

SUTURE: line of junction of two united parts or line marking union of margins of a rolled single part, e.g. a carpel.

SYM- or SYN-: prefix, **included with** or **united** as in **sympetalous** and **synsepalous** —with petals and sepals (esp.) marginally connate (at least at the bases).

SYMBIONT: a symbiotic organism, i.e. an organism living by symbiosis.

SYMBIOSIS: association of organisms with an effect of mutual benefit. In broader sense general term for an association of organisms which may be either not constant or with partners not in close contact **(disjunctive)** or be close and constant **(conjunctive).** The effect of symbiosis may be either **nutritive** or of no direct value. Examples are: A. **Disjunctive** (a) nutritive (1) antagonistic to one—carnivorous plants and their prey (2) reciprocal (nett advantages outweigh nett disadvantages)—dissemination by animal (b) non-nutritive—shading or other effect from one plant to another. **B. conjunctive—** (a) nutritive (1) antagonistic to one—parasitism(2) reciprocal—symbiosis in narrower sense, e.g. by lichens, nitrogen-fixing bacteria, mycorrhiza (b) non-nutritive—commensalism, e.g. by lianes and epiphytes.

SYMMETRY: regularity of form or similarity of structure on each side of an axis.

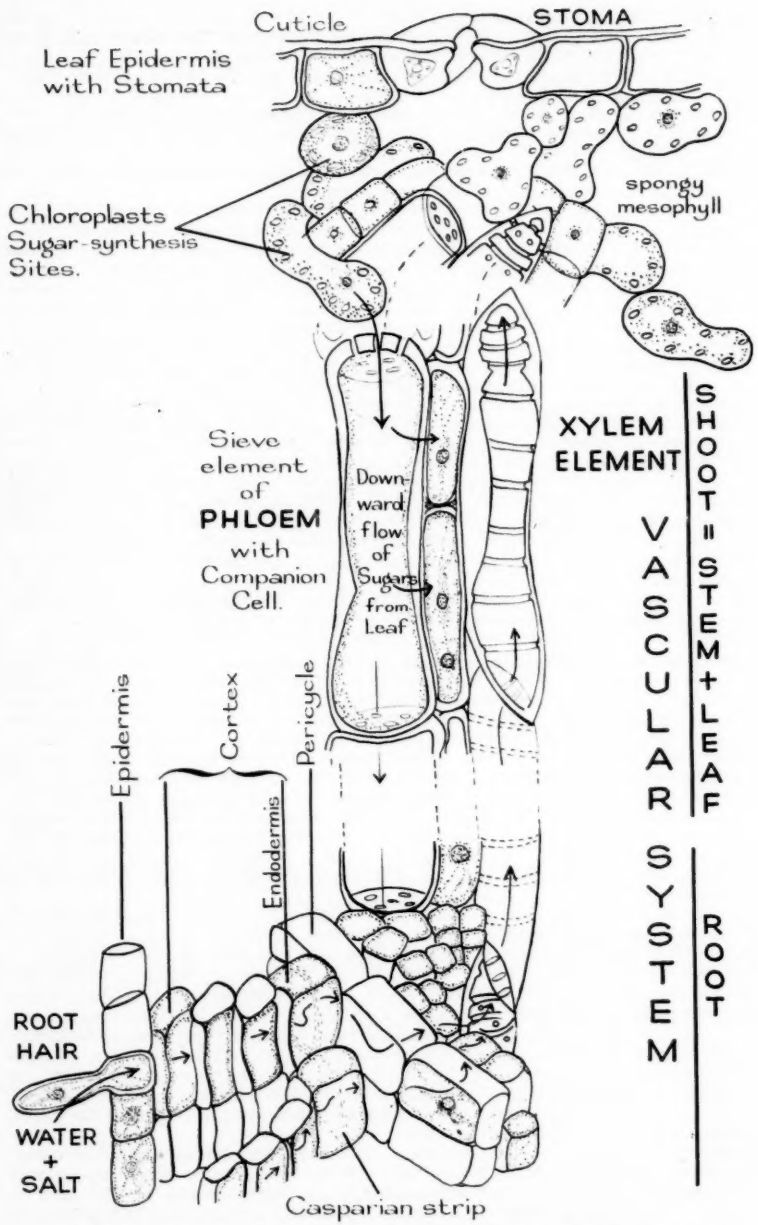
SYNCARP: a multiple fruit formed from several more or less coalescent carpels (fruit of the **Pandanaceae).** See also under fruit.

SYNCARPOUS: with carpel walls within a gynoecium fused to one another.

SYNGENESOUS: with anthers united, usually to form a cylinder around the style, the floral feature characteristic of the **Compositae.**

SYSTEMMATIC BOTANY: research attempting, by use of criteria drawn from current biological knowledge, classification accounting for the evolutionary relationship of plants yet retaining an initial purpose of establishing a univers--ally-acceptable nomenclature to which individual plants may be related or identified. **Biosystemmatics** applies research to the living population in all available fields, **cytotaxonomy** is concerned with genetic behaviour of plants under controlled conditions.

TANNIN: aromatic phenolic derivative with property of precipitating proteins, yielding deeply coloured solutions with heavy metal ions; in plants distributed throughout tissues either in individual cells or in tannin sacs of little known origin and function. Property of protein precipitation utilized in leather tanning industries. Australian plants which have contributed or are contributing to field being the Wattle Barks **(Acacia mearnsii, A. pycnantha, A. irrorata** mainly), Mallet Bark (Brown Mallet **Eucalyptus astringens** with highest tannin content ave. 45%) and to limited extent Mangrove Bark of several native mangroves—



PATHWAYS OF TRANSLOCATION
(PRIMARY GROWTH)

these barks have sufficiently high tan content to be used directly by tanner, a second class include those with low tannin content but desirable quality, marketed as extract—Wandoo Bark **(Eucalyptus wandoo)**, marketed as a solid product Myrtan, provides bulk.

TAPETUM: uniseriate layer of cells formed around a pollen-mother cell and its micro-spores, serving as a nutritive tissue for them.

TAP ROOT: the primary root of a main-root system.

TAXIS: see under tropism.

TAXON: (plural taxa) botanical category relating populations of individuals with certain similarities. Major plant taxa in descending order are division, class, order, family, genus, species.

TAXONOMY: (plant) in narrower sense, establishment of taxa and identification of individuals with those taxa, but usually given equivalence to systemmatic botany.

TENDRIL: a twisting thread-like segment of a leaf or stem serving for support of its parent body.

TEPAL: individual unit of perianth when no differentiation of sepals and petals.

TERATOLOGY: science of abnormal development.

TERETE: shaped like a slender tapered shaft, e.g. leaves of the Mint Bush **Prostanthera teretifolia.**

TERMINAL: at the tip of, apical or distal.

TESTA: the seed-coat, representing the usually hardened integuments of the ovule.

TETRA-: prefix, **four**, as in **tetrad**—a group of four, **tetramerous**—in fours or multiples of four.

TETRAPLOID: polyploid with chromosome number four times that of the initial haploid number for the species.

THALLOID: flat, usually small, undifferentiated to parts, or parts not conspicuous.

THECA: (plural thecae) see under anther.

THORN: much reduced shoot modified to flattened, sharp-pointed expansion, distinct from spine by its point of origin being within a leaf-axil.

THYRSE: compact panicle with indeterminate main axis.

TISSUE: aggregation of cells to more or less specifically functioning units of an organ.

TOMENTOSE: covered with matted dense hairs or wool-like hairs, e.g. leaves of **Clerodendrum tomentosum.**

TORUS: thickened central part of bordered pit membrane (see pit) of a tracheid, surrounded by a more delicate area, an annulus. Also the receptacle of a flower.

TRACE ELEMENT: see under mineral nutrition.

TRACHEARY ELEMENT: conducting element of xylem concerned with transpiration stream, fundamentally a cell elongate, devoid of protoplast and with lignified wall when mature, either a vessel (q.v.) or tracheid which differs from vessel in that it is a simple cell with walls perforated only by simple bordered pits. By reduction or occlusion of lumen and pits, tracheid may become a non-functional fibre (libriform wood fibre), intergrading forms are fibre-tracheids.

TRANSLOCATION: the movement of solutes within a plant, pathways shown in the diagram opposite. Broken lines indicate that the vascular system is continuous from the root, through the stem, to the leaf. Not indicated is the transpiration (q.v.) of water vapour from the large intercellular spaces of the spongy mesophyll of the leaf, through the stomatal cavity and stoma, and to the external atmosphere. The downward passage of photosynthesised materials from the leaf through the phloem system elements is continuous to the root. The diagram represents the tissue system of primary growth; in secondary growth a ray system (q.v.) interconnects the phloem and xylem systems.

TRANSPIRATION: water-loss by evaporation to atmosphere, a necessary consequence in plants to the tremendous amounts of water absorbed by the root-system and achieved by (a) accumulation of water in mesophyll of leaf (b) evaporation through large intercellular spaces to stomata controlling water-loss (c) action of the deficit between water vapor pressure of the atmosphere and vapor pressure within mesophyll, with sunlight accelerating rate of transpiration by increasing vapour pressure within leaf. See also guttation.

TRANSPIRATION-COHESION-TENSION THEORY: concept of movement of water through xylem, from root to atmosphere. Briefly, transpiration from leaf surfaces create deficits in diffusion pressure in lower cell layers which draw

on vascular system for water to equilibrate deficit. Tension in turn is created on water-conducting cells which, in equilibrating turgidity, transmit downward tension effect through vascular column to root, the cohesive tendency of water maintaining upward flow of water column. Roots also exert powerful tension effects (e.g. as evidenced by "bleeding" of stump) which may operate for the transpiration mechanism when the latter is not operative.

TRANSPIRATION STREAM: upward flow through xylem of water and mineral solutes absorbed by root from soil.

TRI-: prefix, **three**, as in **trimerous, triquetous**—in threes or multiples of threes.

TRIBE: see under family.

TRICHOME: collective term for an outgrowth from an epidermis may be unicellular or multicellular, branched or unbranched, usually of cellulose and cuticle-covered, sometimes lignified. May be a root-hair, glandular hair, or non-glandular hair.

TRIPLOID: Polyploid with three times basic haploid chromosome number.

TROPISM: Tendency of an organism to respond to influence of an environmental factor with a greater intensity from one direction than from another. Main environmental factors are (a) intensity or quality of incident light (phototropic curvature), (b) gravity (geotropic curvature), (c) water content of soil (hydrotropic movement), (d) physical contact (thigmatropic movement), (e) specific chemical factor (chemotropic movement). When movement is an overall response independent of the direction of the stimulus that effects all parts uniformly (as in bud development when unequal growth on either side encloses the stem tip), it is a **nastic movement.** When movement concerns locomotion of a cell (e.g. spore or pollen-grain) or mobile organism towards or away from source of stimulus, the movement is a **taxis. Turgor movements** concern the reversible changes in cell volume (e.g. at wilting, or function of stomata).

TRUNCATE: appearing as though chopped off, e.g. a distinctive shape abruptly terminated as a flat topped inflorescence of **Telopea truncata.**

TUBER: thickened underground branch of stem serving as a storage organ. In general, a short thickened part.

TUBERCULATE: with thickened processes or protuberances (tubercles), as the stems and leaves of **Eriostemon difformis.**

TUMOR: type of gall in which typical organoid structure is replaced by malignant, extensive, amorphous outgrowth, e.g. the crown-gall caused by bacterium **Agrobacterium tumifacium**—bacteria-free fragment of this tumor will continue to grow in pure culture media, so producing own auxin.

TURBINATE: rounded, shaped like an inverted cone, drawn from about mid-line to base to give attenuated lower part: the characteristic shape of many fruits.

TURGID: swollen, as actively-functioning cell when cytoplasm is forced against wall by a fully-occupied vacuole.

TURGOR PRESSURE: pressure exerted by cytoplasm against cell wall by the turgidity of a vacuole, counteracted by the back pressure of the wall (wall pressure). When turgor pressure equates wall pressure, tendency of water to leave cell is at neutral.

TYLOSE: balloon-like extrusion in vessel (q.v.) from pit-membrane between vessel and ray cell, formed only when pit is sufficiently large (as in **Eucalyptus).**

TYPE: the individual specimen on which a taxon is based, i.e. a halotype. The element selected from original material as substitute for th halotype is a **lectotype**; when selected as type when original material is missing a **neotype.** An element of original material other than the halotype is a **paratype;** an element selected from original material as substitute for the halotype is a two or more elements used for the type, either in lieu of the halotype or when two or more elements were designated simultaneously as the type, is a **syntype.** An element from the type locality is a **topotype.**

TYPICAL: relative to mean of characters shared by a large number of individuals of a specific population, not necessarily identical or referrable to the taxonomic type.

UMBEL: indeterminate, often flat-topped, inflorescence with pedicellate flowers arising from a common point of the floral axis. Inflorescence of Flannel Flower **Actinotus helianthii** a much contracted umbel.

UMBELLATE: arranged in an umbel or resembling an umbel as the contracted **dichasia** of most eucalyptus inflorescences.

UNCINATE: bearing a short hook-like process at the apex (leaves of Geraldton Wax **Chamaelaucium uncinatum** and Broombush **Melaleuca uncinatum).**

UNDULATE: with margin forming a wave-like line as leaf of **Pittosporum undulatum.**

UNI-: prefix, **one**, as in **unicellular**—consisting of one cell.

UNISEXUAL: of one sex, as a flower in which only one sex is present or functional.

URCEOLATE: globular or ovoid but with top depressed to form short neck.

VACUOLE: inclusion of protoplast bounded by selectively-permeable membrane, functioning for the temporary storage of aqueous solutions of inorganic and organic materials (cell sap) from metabolism. At first minute and scattered, later coalescing to fill most of cell (up to 90% or more) and thus acting in the passage of water from cell to cell.

VALVATE: (1) dehiscing to form valves (2) with parts not overlapping in bud. Cf. imbricate.

VALVE: the segment dehisced from a structure.

VARIATION: expression of a character or set of character differences between individuals as a result of a variance in genotypic constitution and immediate environments. No two individuals are exactly alike but the variance in character of similar individuals forming a population may be represented by a pattern forming a continuous lineal series of expressions ranging from one extreme to another. When this pattern becomes abruptly broken or discontinuous by characters brought by a set of individuals subject, e.g. to a different set of environmental factors, the change in the pattern may be interpreted as an expression of a change in the population structure (segregation) and, dependent on the value placed on the character differences, this change may represent a degree of variation or incipient speciation.

VARIEGATION: condition normal to certain plants where the over-all green tissue of leaves is broken by areas of paler green, white or other colour (e.g. a mottling effect). Conceived as result of somatic mutation of the chloroplasts, a pigment other than the normally dominant chlorophyll being produced.

VARIETY: (also **varietas**) taxon formed from group of individual plants with a minor character sufficiently constant to be recognizably different from other members of its species—may be an incipient segregate from the species. Also sub-species.

VASCULAR PLANT: plant with its water-conducting tissue in the nature of a continuous system or xylem elements (vessels or tracheids). A tracheophyte represented in extant plants by the pteridophytes, gymnosperms and angiosperms. See also class.

VASCULAR SYSTEM: system of conducting tissues in the form of either (1) a solid cylinder in centre of shoot axis (i.e. the protostele of lower pteridophytes and some aquatic angiosperms), bounded on the outside by a cortex, or (2) a hollow cylinder, enclosing a pith, divided into strands of phloem which occur either on one side of the xylem strand (i.e. the collateral bundle of typical of gymnosperms and angiosperms), or on both sides of xylem (i.e. bicollateral bundle of a few dicots with internal phloem). Again, one strand may surround the other (i.e. concentric), either the xylem surrounding the phloem (the amphivasal bundle of chiefly monocots) or the phloem surrounding the xylem (amphicribal bundle most frequent in ferns). Most dicots and gymnosperms have persistent vascular meristem (cambia) developed from promeristem interpolated between xylem (inner) and phloem (outer), but most monocots (typically of scattered bundles predominantly collateral or amphivasal) remain as primary body, secondary growth dependent on protracted or rapid growth (some palms) or (as in arborescent lilies, some palms) cambium may remain active after elongation of shoot to initiate to secondary growth around the primary bundles, with formation of cylinder of new bundles.

VEGETATION: distribution of plant communities in space and time to form a discernible pattern determined by the environmental demands of the individuals which compose it.

VEIN: strand of conducting tissue (vascular bundle) forming an interconnecting system (venation) of water and solute exchange throughout the leaf and continuous with the stem. See also under leaf.

VELAMEN: epidermis of epiphytic adventitious roots consisting of a single outermost cuticularised layer and inner layers of water-storage tissue.

VENATION: vascular system of a leaf (or leaf-order part) of angiosperms: **pinnate** when veins arise at intervals along a central major vein (midrib) and spread feather-wise through the lamina, **palmate** when veins are of same order and arise, fan-wise, from a common point at the leaf-base. The minor veins may form a **reticulate** or meshed system or be **parallel**, separating regions of photo-

synthetic tissue, the vein islets. These patterns are basic and most venations form an intergrading series between them.

VENTRAL: relating to front or inner surface of organ or part. Cf. dorsal.

VERNALIZATION: acceleration of flowering through the application of low temperature at a particular stage of development (most frequently the seed or seedling stage).

VERNATION: arrangement of leaves within a bud, or the development of a single leaf from its primordium.

VERRUCOSE: bearing wart-like protuberances on surface (e.g. fruit, **Myriophyllum verrucosum**, Red Water-milfoil).

VERSATILE: attached about its middle and free to turn. Applied to the attachment of some anthers to their filaments.

VERTICILIATE: arranged in a whorl (leaves, Water Thyme **Hydrilla verticillata).**

VESSEL ELEMENT: tracheary element of angiosperm xylem functioning for conduction, a usually thin-walled cell with walls perforated (mainly at ends, to perforation plate) and in contact with other vessel elements, so fused to form a long continuous tube, a vessel, which may extend for several feet. Vessels occur in series, the end walls not perforated but there is ready passage of water and solute between them.

VESTIGAL: rudimentary; imperfectly developed or undeveloped

VIABLE: capable of development, e.g. germination of seeds. Cf. sterile.

VILLOUS: with long and soft hairs (stems, Woolly Net-Bush **Calothamnus villosus).**

VIRGATE: long, straight and slender (habit, Twiggy Heath-Myrtle **Baechea virgata).**

VIRUS (plant): submicroscopic organic particle associated with disease of plants (e.g. necrotic lesions and mosaic dieseases) and isolated as a crystal with ability to pass through bacterial filter, shown to be a ribonnucleoprotein retaining capacity for re-infection of plant tissue, transmissible by physical contact, by grafting, through soil and by insect vector. Conceived as living organism with a genetic system capable of mutating to produce different strains. **Bacterial virus** shown to operate by reception of virus particle in cell of bacterium, the nucleic acid so released altering the cell metabolism so that duplication of virus material is achieved, the bacterium releasing the material as a **bacteriophage** with capacity for infection, its nucleic acid directing the course of metabolism in the site of infection.

VITAMIN (plant): micro assessory factor, variously distributed in plant tissue but known more from its value in animal nutrition than by its role in plant metabolism. Frequently associated with enzyme as member of prosthetic (co-enzyme) group, usually water-soluble and may be one of following: Vitamin A: a caretenoid precursor of, B. complex: biotin, choline (base of lecithin), folic acid, inositol, nicotine acid, panthothenic acid, pyriodoxine, riboflavin, thiamine; C: ascorbic acid; D: calciferol; A fat-soluble irradiated sterol; K: naphthoquinone.

VIVIPARY: germination of seed before abscission of its fruit.

WAX: ester of alcohol (other than glycerol), in plant tissue primarily a cell-wall component of cuticle (leaves, fruit) and within endosperm.

WHORL: radial group of leaves or flowers at a node, or the sterile and fertile parts of a flower arising from receptacle in cyclic manner.

WILTING: loss of turgidity in plants by transpiration rate becoming higher than water-supplying power of soil-root system, reaching a climax **(permanent wilted condition)** when the full saturation of air with moisture to halt transpiration produces no response by the plant to restore turgidity. The percentage of water remaining in the soil when a plant reaches permanent wilting is the **permanent wilting percentage** of the soil and varies from 1-15% being low in coarse sandy soil, and high in fine clay soils.

WING: thin, dry or membranous expansion of an organ or part. See also pterospermous, papilionaceous, amplexicaul.

WOOD: the supporting secondary xylem of a trunk or branch, made up of an outer lighter-coloured zone—sapwood—sometimes extensive but frequently limited (as in eucalypts) to a narrow band of actively-functioning cells for storage (hence rich in starch) and the upward conduction of sap, and the **truewood** or **heartwood** which represents the once active parenchyma cells of the sapwood now functionless and dark-coloured (due to deposition of tannins, resins or other dark-coloured materials) during their transition. Concurrent with the deposition of materials there is in angiosperm wood (the "hardwoods" or "pored" i.e. vesselled wood) a frequent blocking of vessels by either tyloses (q.v.) or secretion (e.g. resin) from ray parenchyma. In non-vesselled wood

softwood or non-pored wood of most conifers) blockages may occur by deposition of resin or closure of the tracheid pit.

WOODLAND: plant community dominated by low to tall-growing trees with trunks of length usually not greater than depth of the crowns. Dominant trees of Australian temperate woodlands are either evergreen and sclerophyllous (eucalypts and wattles) or evergreen and needle-leaved (native cypresses) and these frequently form a Savannah Woodland where the tree canopy is open and there is a well-developed low layer of grasses.

WOUND HORMONE: specific growth substance released from injured cells of a wounded tissue which stimulates activity of uninjured cells to initiate new growth.

XANTHO-: prefix, yellow-coloured, as in xanthophyll—carotenoid pigment commonly associated with chloroplasts (e.g. Zeaxanthin, the yellow pigment of yellow maize seeds).

XERO-: prefix, **dry** as in xerotherm—plant surviving in conditions of drought and heat.

XEROMORPHY: structural change (e.g. by reduction in cell size, by development of a thick cuticle and abundant scelerenchyma or by reduced leaf-size) within a plant which appears to be of value in moisture-conservation when exposed to recurrent drought. Under equivalent moisture conditions, **xeromorphs** have been noted to have higher transpiration rate than have mesophytes, hence structural change is considered consequence of physiological processes (e.g. regulation of osmosis) to enable retention within plant of water rather than an adaptive response to drought.

XEROPHYTE: plant which, by modification in form and/or function, is able to escape or endure recurrent drought. Beside xeromorphy (q.v.) other means include that by the desert ephemeral which escapes drought by completing life-cycle between droughts (thus in dormant seed phase during drought) and the succulent which conserves water by the development of water-retaining tissue with an associated low transpiration rate and consequent low growth rate.

XYLEM: the water and mineral solute conducting, and supporting tissue system of vascular plants. In secondary-thickened trunks and branches made up of a vertical (axial) system of wood-parenchyma together with the specialised tracheary elements and fibres, and a transverse system of ray parenchyma (see ray system). See also wood,

ZYGOMORPHIC: bilaterally symmetrical: when applied to a perianth, divisible into halves by one plane only (characteristic of orchid, labiate and papilion flowers).

ZYOTE: the single cell formed from a nuclear fusion at a fertilization from which develops an embryo.

In his transcription from original notes, the writer regrets omission of the following:

PARASITE: an organism dependent on another organism (the host) for its nutrition. Flowering plants may parasitise by root-connection (e.g. sandalwoods **Santalum** spp., **Exocarpus** spp. (ballarts) and **Fusanus (Eucarya)** spp. (quandongs), the W.A. Christmas Tree **(Nuytsia floribunda)**, or by stem-connection (e.g misteltoes **Loranthus** and **Amyema** spp.); others develop from the soil as independent plants, becoming fully parastic when securing a hold on the aerial parts of a host (e,g, dodders **Cuscuta** spp. and dodder-laurels **Cassytha** spp.). Some parasites (hyperparasites) may parasitise other parasites, e.g. **Notothixos** on mistletoe, mistletoe on mistletoe, etc. Examples quoted are termed partial parasites because of their dependence only for mineral nutrition from their host and are chlorophyll-bearing: a chlorophyll-less (or with very little supply) parasite is represented by the Broom Rape **Orobanche cernua** var. **australiana**, a root-parasitic herb.

PARTHENOCARPY: development of fruit without fertilization and seed formation. Rather rare in nature but fairly frequent in horticultural varieties of normally seed-bearing plants (e.g. the seedless bananas and grapes). An auxin appears essential in fruit development and normally is supplied by a stimulus from fertilization processes—by application of a suitable auxin to the ovary, pollination may be circumvented and parthenocarpy induced.

PLACENTATION:add to term already defined—in single or free carpels either **sub-marginal** when ovules are borne in rows close to the carpel suture—when few in number and concentrated at the base of the suture **(basal)** or towards the apex (apical)—or **laminar** (also **diffuse)** when there is a wider distribution.

In connated carpels, placentation may also be **laminar** but when fundamentally submarginal, is **axile** when carpels are closed and the ovules are grouped around a central axis (e.g. a projection of the receptacle) or, when carpels are marginally connate to form a unilocular gynoecium, **parietal** when the ovules are borne on the ovary wall, typically in longitudinal rows, **free central** when borne free from the wall but on a central process and **basal** when there is no central process or projection of the placentae. **Apical** placentation denotes for the syncarpous gynoecium the arrangement of ovules reduced in number and restricted in position to the "ceiling" of the locule or close to this position, often pendulous on long funicles. Orientation of the ovule in relation to its placenta may be **orthotropous** when the ovule is erect, its micropyle distal and funicle short or absent; **anatropous** when the ovule is turned over (deflexed) at the chalaza region and pressed against or adnate with the funicle, the micropyle usually facing the placenta (see diagram p.10), **campylotropous** when more or less "n"-shaped, the micropyle facing the placenta and the ovule attached about midway, **amphitropous** when the first half of the ovule is adnate with the funicle and the micropyle faces laterally the placenta.

Plant Life — A Perspective

". . . Hence it is that wherever the eye is directed it encounters an infinite multitude of the most dissimilar forms of vegetation. Some are cast ashore by the ocean in the form of leathery straps or thongs, or are collected into pelagic meadows of vast extent; others crawl over mines and illuminate them with phosphorescent gleams. Rivers and tranquil waters teem with green filaments, mud throws up its gelatinous scum, the human lungs, ulcers, and sordes of all sorts bring forth a living brood, timber crumbles to dust beneath indidious spawn, corn crops change to fetid soot, all matter in decay is seen to teem with mouldy life; and those filaments, that scum-bred spawn and mould, alike acknowledge a vegetable origin. The bark of ancient trees is carpeted with velvet, their branches are hung with a grey-beard tapestry, and microscopical scales overspread their leaves; the face of rocks is stained with ancient colours, coeval with their own exposure to air; and those too are citizens of the great world of plants. Heaths and moors wave with a tough and wiry herbage; meadows are clothed with an emerald mantle, amidst which spring flowers of all hues and forms, bushes throw aboard their many-fashioned foliage, twiners scramble over and choke them, above all wave the arms of the ancient forest, and these too acknowledge the sovereignty of Flora. Their individual forms too change at every step. With every altered condition and circumstance new plants start up. The mountains side has its own races of vegetable inhabitants, and the valleys have theirs the tribes of the sand, the granite, and the limestones are all different; and the sun does not shine upon two degrees on the surface of this globe the vegetation of which is identical: for very latitude has a Flora of its own. In short, the forms of seas, lakes, and rivers, islands and peninsulas, hills, valleys, plains, and mountains are not so infinitely diversified as that of the vegetation which adorns them."

—John Lindley in his Introduction to **The Vegetable Kingdom**, 3rd edn., London, 1853.

Plant Life — Rationalization

Systemmatics attempts a scheme linking groups of similar individuals. In the days of Linnaeus, this scheme was considered as a lineal series starting from the simplest form. Today, system has become a reticulate linkage, each group of related plants being considered derived not from a previous group in a scheme, but from an ancestor whose record may not be known. Each hierarchy of plants, then, has its own evolutionary history, and arises concurrently with other groups, or is the direct descendant of a progenitor of several latter formed groups.

The following relates the vascular plant families of Australia to their orders (ending in -ales), to their class (indicated by capital), and division (ending in -phyta). Space requirements preclude the inclusion of all known genera so that the lists are representative, in general favouring both temperate and tropical genera: most, if not all, genera known to cultivation are listed.

ABBREVIATIONS: To save unnecessary repetition, family name-endings in **aceae**, the aceae is omitted and replaced by ‡. Monogeneric families are marked with (M); when monogeneric and tropical or sub-tropical only (T). Families endemic to Australia are marked*. Families indexed alphabetically on Page 64.

Introd. indicates that the genus is not native but is sufficiently widespread and "wild" to merit its inclusion.

Because it is readily referable, the system of Hutchinson (1959) is followed throughout for dicots and monocots.

I PTERIDOPHYTA

A. PTEROPSIDA

1. Filicales: OSMUND‡ **Osmunda,** Todea; SCHIZAE‡ **Lygodium,** Schizaea; GLEICHENI‡ **Gleichenia, Sticherus;** HYMENOPHYLL‡ **Hymenophyllum, Macroglena, Mecodium, Microgonium, Polyphlebium;** CYATHE‡ **Cyathea;** DICKSONI‡ **Dicksonia** DENNSTAEDTI‡ **Culcila, Dennstaedtia, Histiopteris, Hypolepis, Pteridium;** LINDSAY‡ **Lindsaya;** PTERID‡ **Adiantum, Annogramma, Cheilanthes, Pellaea, Pteris;** VITTARI‡ **Vittaria;** DAVALLI‡ **Arthropteris, Davallia, Humata, Nephrolepis, Oleandra, Rumohra;** GRAMMITID‡ **Ctenopteris, Grammitis;** POLPYPODI‡ **Belvisia, Dictymia, Drynaria, Microsorium, Platycerium, Pyrrosia;** ASPIDI‡ **Arachniodes (Athyrium, Cystopteris, Diplazium** or ATHYRI‡) **Lastreopsis, Polystichum;** THELYPTERID‡ **Cyclosorus;** ASPLENI‡ **Asplenium, Pleurosorus;**

BLECHN‡ **Blechnum, Doodia;** MARSILE‡ **Marsilea, Pilularia;** AZOLL‡ **Azolla;** SALVINI‡ **Salvinia.**

2. Marattiales: MARATTI‡ **Marattia.**

3. Ophiolglossales: OPHIOGLOSS‡ **Botrychium, Ophioglossum.**

II LYCOPHYTA

A. LYCOPSIDA

1. Lycopodiales: LYCOPODI‡ **Lycopodium, Phylloglossum.**

2. Selaginellales: SELAGINELL‡**Selaginella** (M).

3. Isoetales: ISOET‡ **Isoetes** (M).

III. PSILOPHYTA

A. PSILOPSIDA

1. Psilotales: PSILOT‡ **Psilotum, Tmesipteris.**

IV. SPERMATOPHYTA

A. CONOPSIDA

Pinales: CUPRESS‡ **Callitris, Diselma;** ARAUCARI‡ **Agathis, Araucaria;** PODOCARP‡ **Actinostrobus, Dacrydium, Microcachrys, Microstrobus, Pherosphaera, Podocarpus;** TAXODI‡ Athrotaxis (Tas., endem.).

B. CYCADOPSIDA

1. Cycadales: CYCAD‡ **Cycas;** ZAMI‡ **Bowenia, Lepidozamia, Macrozamia.**

C. ANGIOSPERMAE

C i. DICOTYLEDONEAE

1. Magnoliales: WINTER‡ **Bubbia, Drimys;** HIMANTANDR‡ **Himantandra** (T).

2. Annonales: ANNON‡ **Acana, Polyalthia, Rauwenhoffia, Uvaria;** EUPOMATI‡ **Eupomatia** (M)*.

3. Laurales: MONIMI‡ **Atherosperma, Daphnandra, Doryphora, Hedycarya, Palmeria, Tetrasyandra, Wilkiea;** AUSTROBAILEY‡* **Austrobaileya** (T); TRIMENI‡ **Piptocalyx;** LAUR‡ **Beilschmiedia, Cassytha, Cinnamomum, Cryptocarya, Endiandra, Litsea, Neolitsea;** HERNANDI‡ **Hernandia, Gyrocarpus;** MYRISTIC‡ **Myristica.**

4. Dilleniales: DILLENI‡ **Hibbertia, Pachynema, Wormia.**

5. Rosales: ROS‡ **Acaena, Agrimonia, Alchemilla, Aphanes, Geum, Potentilla, Rubus, Stylobasium.**

6. Leguminales: CAESALPINI‡ **Bauhinia, Cassia, Caesalpinia, Erythrophloeum, Labichea, Mezoneurum, Petalostylis, Peltophorum, Tamarindus;** MIMOS‡ **Acacia, Albizzia, Neptunia, Pithecellobium;** PAPILION‡ **Alysicarpus, Aotus, Barklya, Bossiaea, Brachysema, Burtonia, Cantharospermum, Castanospermum, Chorizema, Clianthus, Crotalaria, Daviesia, Desmodium, Dillwynia, Dolichos, Erythrina, Eutaxis, Gastobolium, Glyceria, Glycine, Gompholobium, Goodia, Hardenbergia, Hovea, Indigofera, Jacksonia, Kennedya, Latrobea, Lotus, Milletia, Mirbelia, Nemcia, Oxylobium, Phaseolus, Pithycolobium, Platylobium, Psoralea, Pultenaea, Rhynochosia, Sesbania, Sphaerolobium, Swainsona, Tephrosia, Templetonia, Vigna, Viminaria, Wistaria, Zornia.**

7. Cunoniales: CUNONI‡ **Ackama, Anodopetalum, Aphanopetalum, Callicomea, Ceratolpetalum, Geissos, Pseudoweinmannia, Schizomeria, Vesselowska;** DAVIDSONI‡ **Davidsonia** (T)* ESCALLONI‡ **Abrophyllum, Argophyllum, Anopterus, Cuttsia, Polyosma, Quintinia, Tetracarpaea;** BAUER‡* **Bauera.**

8. Styracales: SYMPLOC‡ **Symplocos** (T).

9. Araliales: ALANGI‡ **Alangium (M);** ARALI‡ **Astrotricha, Brassaia, Panax, Tieghemopanax;** CAPRIFOLI‡ **Sambucus.**

10. Balanopsidales: BALANOPSID‡ **Balanops** (T).

11. Fagales: FAG‡ **Nothofagus.**

12. Casuarinales: CASUARIN‡ **Casuarina** (M).

13. Urticales: ULM‡ **Aphananthe, Celtis, Trema;** MOR‡ **Antiaris, Fatoua, Ficus, Malaisia, Pseudomorus** URTIC‡ **Laportea, Parietaria, Pipturus, Pouzolzia,**

14. Bixales: FLACOURTI‡ **Scolopia, Streptothamnus, Xylosma;** COCHLOSPERM‡ **Cochlospermum.**

15. Thymelaeales: THYMELAE‡ **Drapetes, Phaleria, Pimelea, Wikstroemia;** NYCTAGIN‡ **Boerhaavia, Heimerliodendron, Pisonia.**

16. Proteales: PROTE‡ **Adenanthos, Banksia, Buckinghamia, Cardwellia, Conospermum, Darlingia, Drvandra, Embothrium, Grevillea, Hakea. Helicea, Hicksbeachia, Isopogon, Lambertia, Lomatia, Macadamia, Orites, Persoonia, Petrophila. Stenocarpus. Synaphea, Telopea, Xylomelum.**

17. Pittosporales: PITTOSPOR‡ **Billardiera, Bursaria, Cheiranthera, Citrio-**

batus, Hymenosporum, Marianthus, Pittosporum, Pronaya, Sollya; BYBLID‡ Byblis; TREMANDR‡* Platytheca, Tetratheca, Tremandra.

18. Capparidales: CAPPARID‡ Apophyllum, Breynia, Capparis, Cleome, Emblingia, Roeperia.

19. Tamaricales: FRANKENI‡ Frankenia.

20. Violales: VIOL‡ Hybanthus, Hymenanthera, Viola.

21. Polygalales: POLYGAL‡ Bredemeyera, Comesperma, Polygala, Salamonia, Xanthophyllum.

22. Passiflorales: PASSIFLOR‡ Adenia, Passiflora.

23. Cucurbitales: CUCURBIT‡ Bryonopsis, Cucumis, Melothria, Momordica, Trichosanthes.

24. Cactales: CACT‡ Opuntia (introd.).

25. Tiliales: TILI‡ Corchorus, Grewia, Trimfettia; STERCULI‡ Argyrodendron, Brachychiton, Commersonia, Guichenotia, Keraudrenia, Lasiopetalum, Melschia, Rulingia, Sterculia, Tarrietia, Thomasia Waltheria; BOMBAC‡ Bombax, Adansonia.

26. Malvales: MALV‡ Abutilon, Alyogyne, Brockmannia, Camptostemon, Gossampinus, Gossypium, Hibiscus, Howittia, Lagunaria, Lavatera, Notoxylinon, Malvastrum, Pavonia, Plagianthus, Sida.

27. Malpighiales: LIN‡ Linum; ERYTHROXYL‡ Erythroxylum; ZYGOPHYLL‡ Nitraria, Tribulus, Zygophyllum.

28. Euphorbiales: EUPHORBI‡ Antidesma, Baloghia, Bertya, Beyeria, Bridelia, Breynia, Claoxylon, Croton, Dissiliaria, Excoecaria, Euphorbia, Fluggia, Fontainea, Glochidion, Hemicyclia, Homalanthus, Longetia, Macaranga, Mallotus, Monotaxis, Petalostigma, Phyllanthus, Ricinocarpus, Stachystemon.

29. Ericales: ERIC‡ Gaultheria, Rhododendron, Wittsteinia; EPACRID‡ Adansonia, Bombax.
Cyathodes, Epacris, Leucopogon, Lissanthe, Lysinema, Melichrus, Monotocca, Needhamia, Oligarrhena, Prionotes,, Richea, Sphenotoma, Sprengelia, Styphelia, Trochocarpa.

30. Guttiferales: HYPERIC‡ Hypericum: EUCRYPHI‡ Eucryphia (M).

31. Myrtales: MYRT‡ Acmena, Agonis, Angophora, Astartea, Backhousia, Baeckea, Balaustion, Beaufortia, Callistemon, Calothamnus, Calycotrix, Chamaelaucium, Choricarpia, Darwinia, Eremaea, Eucalyptus, Eugenia, Homoranthus, Hypocalymma, Kunzea, Leptosuermum, Lhotzkya, Melaleuca, Micromyrtus, Osbornia, Pileanthus, Regelia, Rhodamnia, Rhodomyrtus, Scholtzia, Syncarpia, Syzygium, Thryptomene, Tristania, Verticordia, Xanthostemon; LECYTHID‡ Barringtonia, Careya; RHIZOPHOR‡ Bruguiera, Carallia, Ceriops, Rhizophora; SONNERATI‡ Sonneratia; COMBRET‡ Terminalia; MELASTOMAT‡ Melastoma, Memecylon, Osbeckia.

32. Celastrales: AQUIFOLI‡ (Ilicaceae) Bryonia; ICACIN‡ Citronella, Pennantia; CELASTR‡ Celastrus, Denhamia, Elaeodendron, Hedraianthera, Maytenus, Psammomoya; CORYNOCARP‡ Corynocarpus (T); STACKHOUSI‡ Macgregoria, Stackhousia, Tripterococcus; HIPPOCRATE‡ Hippocratea; CAPUSI‡ (Siphonodont‡); Siphonodon (T).

33. Olacales: OLAC‡ Olax, Ximenia; OPILI‡ Cansjera, Opilia.

34. Santalales: LORANTH‡ Amyema, Dendrophthoe, Loranthus, Muellerina, (Phygilanthus), Notothixos; SANTAL‡ Anthobolus, Choretrum, Exocarpus, Fusanus (Eucaryxa), Leptomeria, Santalum, Thesium.

35. Rhamnales: ELAEAGN‡ Elaeagnus; RHAMN‡ Alphitonia, Blackallia, Cryptandra, Discaria, Emmenosperma, Pomaderris, Siegfriedia, Spyridium, Trymalium, Ventilago, Zizyphus; VIT‡ Cayratia, Cissus, Leea, Vitis.

36. Myrsinales: MYRSIN‡ Ardisia, Myrsine, Rapanea; AEGICERAT‡ Aegiceras (T).

37. Ebenales: EBEN‡ Diospyros, Maba; SAPOT‡ Amorphospermum, Chrysophyllum, Mimusops, Niemeyera, Planchonella, Sideroxylon.

38. Rutales: RUT‡ Acronychia, Asterolasia, Atalantia, Boronia, Bosistoa Chorilaena, Citriobatus, Correa, Crowea, Diplolaena, Eremocitrus, Eriostemon, Euodia, Flindersia, Geijera, Geleznowia, Halfordia, Medicosma, Melioscope, Microcitrus, Microcybe, Micromelum, Murraya, Pagetia, Pentaceras, Phebalium, Philotheca, Pleiococca, Prostanthera, Rossita, Xanthoxylum, Zieria; SIMAROUB‡ Ailanthus, Brucea, Cadellia, Guilfoylia, Harrisonia; BURSER‡ Canarium, Garuga, Protium.

39. Meliales: MELI‡ Aglaia, Carapa, Dysoxylum, Melia, Owenia, Pseudocarapa, Synoum, Toona, Turraea.

40. Sapindales: SAPIND‡ Alectryon, Aryfera, Atalava, Cardiospermum, Castanospora, Cupaniospis, Diplopeltis, Dodonaea, Guioa, Harpullia, Heteroden-

dron, Jagera, Mischocarpus, Nephelium, Toechima; ANACARDI‡ Buchanania, Blepharocarya, Euroschinus, Pleiogynium, Rhodosphaera; AKANI‡* Akania (M).

41. Loganiales: POTALI‡ Fagraea; LOGANI‡ Geniostoma, Logania; SPIGELI‡ Mitrasacme, Mitreola; STRYCHN‡ Strychnos; OLE‡ Gymnelaea, Jasminum, Ligustrum, Linociera, Notelaea, Olea.

42. Apocynales: APOCYN‡ Alstonia, Alyxia, Carissa, Cerbera, Chilocarpus, Ervatamia, Lyonsia, Ochrosia, Parsonsia, Wrightia; ASCLEPIAD‡ Cynanchum, Daemia, Gymnema, Hoya, Marsdenia, Pentatropis, Sarcostemma, Tylophora, Vincetoxicum.

43. Rubiales: RUBI:‡ Asperula, Canthium, Coprosma, Galium, Gardenia, Hodgkinsonia, Ixora, Morinda, Oldenlandia, Opercularia, Pomax, Randia, Rubus, Spermacoce.

44. Bignoniales: BIGNONI‡ Dolichandrone, Pandorea, Tecomanthe; PEDALI‡ Josephinia; MARTYNI‡ Martynia (Introd.).

45. Verbenales: EHRETIA‡ Ehreia, Halgania; VERBEN‡ Avicennia, Clerodendrum, Eryngium, Gmelina, Premna, Verbena; CHLOANTH‡* Chloanthes, Cyanostegia, Dicrastyles, Denisonia, Lachnostachys, Mallophora, Newcastlia, Physopsis, Pityrodia, Spartothamnus.

46. Ranales: RANUNCUL‡ Clematis, Myosorus, Ranunculus; HELLEBORI‡ Caltha; NYMPHAE‡ Nelumbo, Nymphaea; CERATOPHYLL‡ Ceratophyllum (M); CABOMB‡ Brasenia.

47. Berberidales: MENISPERM‡ Carronia, Cocculus, Fawcettia, Sarcopetalum, Stephania, Tinospora.

48. Aristolochiales: ARISTOLOCHI‡ Aristolochia; NEPENTH‡ Nepenthes (T).

49. Piperales: PIPER‡ Piper, Peperomia.

50. Rhoedales: PAPAVER‡ Argemone, Papaver; FUMARI‡ Fumaria (introd.).

51. Cruciales: CRUCIFERAE‡ Alyssum, Barbarea, Cardamine, Cheesamannia, Coronocarpus, Cuphonotus, Erophila, Hymenolobus, Lepidium, Rorippa, Stenopetalum.

53. Caryophyllales: ELATIN‡ Bergia, Elatine; MOLLUGIN‡ Mollugo; CARYOPHYLL‡ Colobanthus, Dysphania, Gypsophila, Polycarpaea, Scleranthus, Spergularia, Stellaria; AIZO‡ Aizoon, Carpobrotus, Disphyma, Galenia, Gunnia, Macarthuri, Mesembryanthemum, Mollugo, Tetragonia, Trianthema; PORTULAC‡ Calandrinia, Claytonia, Montia, Portulaca.

54. Polygonales: POLYGON‡ Emex, Muehlenbeckia, Polygonum, Rumex.

55. Chenopodiales: PHYTOLACC‡ Phytolacca; GYROSTEMON‡* Codonocarpus, Cypselocarpus, Didymotheca; DYSPHANI‡ Dysphania; Gyrostemon, Tersonia; PETIVERI‡ Monococcus; CHENOPODI‡ Arthrocnemum, Atriplex, Bassia, Chenopodium, Kochia, Rhagedia, Salicornia, Salsola, Suaeda; DYSPHANI‡ Dysphania; AMARANTH‡ Alternanthera, Amaranthus, Gomphrena, Ptilotus, Trichinium.

56. Lythrales: LYTHR‡ Ammannia, Lythrum, Pemphiss; ONAGR‡ Epilobium, Jussiaea, Ludwigia; HALORAGI‡ Gunnera, Haloragis, Loudonia, Meziella; Myriophyllum; CALLITRICH‡ Callitriche (M).

57. Gentianales: GENTIAN‡ Centaurium, Erythraea, Gentiana, Limnanthemum, Sebaea; MENYANTH‡ Liparophyllum, Nymphoides, Villarsia.

58. Primulales: PRIMUL‡ Anagallis, Lysimachia, Samolus; PLUMBAGIN‡ Limonium, Plumbago.

59. Plantaginales: PLANTAGIN‡ Plantago.

60. Saxifragales: CRASSUL‡ Crassula, Tillaea; CEPHALOT‡ Cephalotus (W.A.); SAXIFRAG‡ Saxifraga; EREMOSYN‡ Eremosyne (W.A.); DONATI‡ Donatia (Tas.).

61. Sarraceniales: DROSER‡ Aldroandra, Drosera.

62. Umbellals: UMELLIFERAE Actinotus, Centella, Didiscus, Eryngium, Homalosciadium, Hydrocotyle, Lilaeopsis, Neoscidiadium, Oreomyrrhis, Platysace, Seseli, Trachymene, Xanthosia.

63. Campanales: CAMPANUL‡ Wahlenbergia; LOBELI‡ Isotama, Lobelia, Pratia.

64. Goodeniales: GOODENI‡ Anthotium, Calogyne, Dampiera, Diaspasis, Goodenia, Leschenaultia, Scaevola, Selliera, Velleia; BRUNONI‡* Brunonia (M); STYLIDI‡ Forstera, Levenhookia, Stylidium.

65. Asterales: COMPOSITAE‡ Bidens, Blumea, Brachycome, Brachyloma, Calotis, Cassinia, Calocephalus, Cephalipterum, Craspedia, Glossogyne, Helichrysum, Helipterum, Humea, Moenia, Myriocephalus, Olearia, Pluchea, Podolepis, Pterigeron, Pterocaulon, Senecio, Vittadinia, Waitzia, Wedelia.

66. Solanales: SOLAN‡ Anthocercis, Anthotroche, Datura, Duboisia, Isandra,

Lycium, Nicotiana, Physalis, Solanum; CONVOLVUL‡ **Carpentia, Convolvulus, Dichondra, Evolvulus, Greweria, Ipomoea, Polymeria, Wilsonia.**

67. Personales: SCROPHULARI‡ **Ambulia, Buechnera, Euphrasia, Glossostigma, Gratiola, Limosella, Lindernia, Mimulus, Morgania, Pentstemon, Stemodia, Striga, Veronica;** ACANTH‡ **Dipteracanthus, Eranthemum, Graptophyllyum, Justicia, Rostellularia, Ruellia;** GESNERI‡ **Fieldia;** OROBANCH‡ **Orobanche;** LENTIBULARI‡ **Polypompholyx, Utricularia.**

68. Geraniales: GERANI‡ **Erodium, Geranium, Pelargonium;** OXALID‡ **Oxalis.**

69. Polemoniales: POLEMONI‡ **Gilia** (introd.); HYDROPHYLL‡ **Hydrolea;** CUSCUT‡ **Cuscuta** (M).

70. Boraginales: BORAGIN‡ **Cynoglossum, Echium, Heliotropum, Lappula, Myosotis, Tournefortia, Trichodesma.**

71. Lamiales: MYOPOR‡ **Eremophila, Myoporum, Pholidia, Stenochilus;** LABIATAE‡ **Ajuga, Hemiandra, Hemigenia, Lycopus, Mentha, Microcorys, Moschosma, Plectranthus, Prostanthera, Prunella, Salvia, Scutellaria, Teucrium, Westringia, Wrixonia.**

C ii. MONOCOTYLEDONEAE

72. Butomales: HYDROCHARIT‡ **Blyxa, Elodea (Anacharis), Halophila, Hydrilla, Hydrocharis, Ottelia, Vallisnaria;** BUTOM‡ **Tenagocharis.**

73. Alismatales: ALISMAT‡ **Alisma, Caldesia, Damasonium, Sagittaria**

74. Juncaginales: JUNCAGIN‡ **Cycnogeton, Maundia, Triglochin;** POSIDONI‡ **Posidonia** (M).

75. Aponogetonales: APONOGETON‡ **Aponogeton** (M); ZOSTER‡ **Zostera.**

76. Potamogetonales: POTAMOGETON‡ **Potamogeton;** RUPPI‡ **Ruppia** (M).

77. Najadales: ZANNICHELLI‡ **Amphibolis, Cymodocea, Lepilaena, Zannichellia;** NAJAD‡ **Najas** (M).

78. Commelinales: COMMELIN‡ **Aneilema Commelina, Tradescantia** (introd.).

79. Xyridales: XYRID‡ **Xyris.**

80. Eriocaulales: ERIOCAUL‡ **Eriocaulon.**

81. Zingiberals: ZINGIBER‡ **Alphinia, Amomum, Tapeinochilus, Zingiber;** CANN; **Canna** (M) introd.

82. Lilales: LILI‡ **Agrostocrinum, Alania, Anguillaria, Arthropodium, Astelia, Arnocrinum, Bartlingia, Borya, Blandfordia, Bulbinopsis, Caesia, Chamaescilla, Corynotheca, Dianella, Dichopogon, Drymophila, Hensmania, Herpolirion, Hewardia, Hodgsoniola, Iphigenia, Johnsonia, Kreysigia, Kreysigia, Reya Sowerbaea, Stawellia, Stypandra, Thysanotus, Tricoryne, Wurmbea;** PONTEDERI‡ **Eichhornia (introd.);** SMILAC‡ **Ripogonum, Smilax.**

83. Alstroemeriales: ALSTROEMERI‡ **Alstroemeria** (introd.); PETERMANNI‡* **Petermannia** (M); PHILESI‡ **Elachanthera, Eustrephus, Geitonoplesium.**

84. Arales: AR‡ **Alocasia, Gymnostachys, Pothos, Typhonium;** LEMN‡ **Lemna, Wolffia.**

85. Typhales: SPARGANI‡ **Sparganium;** TYPH‡* **Typha** (M).

86. Amaryllidales: AMARYLLID‡ **Calostemma, Crinum, Eurycles.**

87. Iridales: IRID‡ **Diplarrhena, Isophysis, Libertia, Orthrosanthus, Patersonia.**

88. Dioscoreales: ROXBURGHI‡ **Stemona;** DIOSCORE‡ **Dioscorea.**

89. Agavales: XANTHORROE‡ **Acanthocarpus, Baxteria, Calectasia, Chamaexeros, Dasypogon, Kingia, Lomandra, Xanthorrhaea;** AGAV‡ **Cordyline, Doryanthes.**

90. Palmales: PALMAE **Archontophoenix, Arenga, Bacularia, Calamus, Calyptrocalyx, Caryota, Clinostigma, Hydriastele, Livistona, Ptychosperma.**

91. Pandanales: PANDAN‡ **Freycinetia, Pandanus.**

92. Haemodorales: HAEMODOR‡ **Anigozanthos, Blancoa, Conostylis, Haemodorum, Macropidia, Phlebocarya, Tribonanthes;** HYPOXID‡ **Campynema, Hypoxis;** APOSTASI‡ **Apostasia;** TACC‡ **Tacca;** PHILYDR‡ **Helmholtzia, Philydrella, Philydrum, Orthothalyx.**

93. Burmanniales: BURMANNI‡ **Burmannia;** THISMI‡ **Sarcosiphon, Thismia.**

94. Orchidales: ORCHID‡ **Caladenia, Chiloglottis, Cryptostylis, Cymbidium, Dendrobium, Dipodium, Diuris, Gastrodia, Glossodia, Habenaria, Microtes, Prasophylum, Orthothylax.**

95. Juncales: JUNC‡ **Juncus, Luzula;** CENTROLEPID‡ **Aphelia, Brizula, Centrolepis, Juncella.** RESTION‡ **Anarthria, Calorophus, Coleocarya, Dielsia, Ecdeicolea, Hopkinsia, Hypolaena, Lepidobolus, Leptocarpus, Lepyrodia, Loxocarya, Lyginia, Meeboldina, Restio.**

96. Cyperales: CYPER‡ **Carex, Caustis, Cladium, Cyperus, Eleocharis,**

Fimbristylis, Gahnia, Schoenus, Scirpus, Scleria.

97. Graminale: GRAMINEAE **Agrostris, Andropogon, Aristida, Chloris, Bromus, Cymbopogon Cynodon, Digitaria, Eragrostis, Festuca, Panicum, Paspalidium, Paspalum, Pennisetum, Phragmites, Poa, Setaria, Sorghum, Spinifex, Sporobolus, Stipa, Triodia, Tragus, Zoisia.**

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